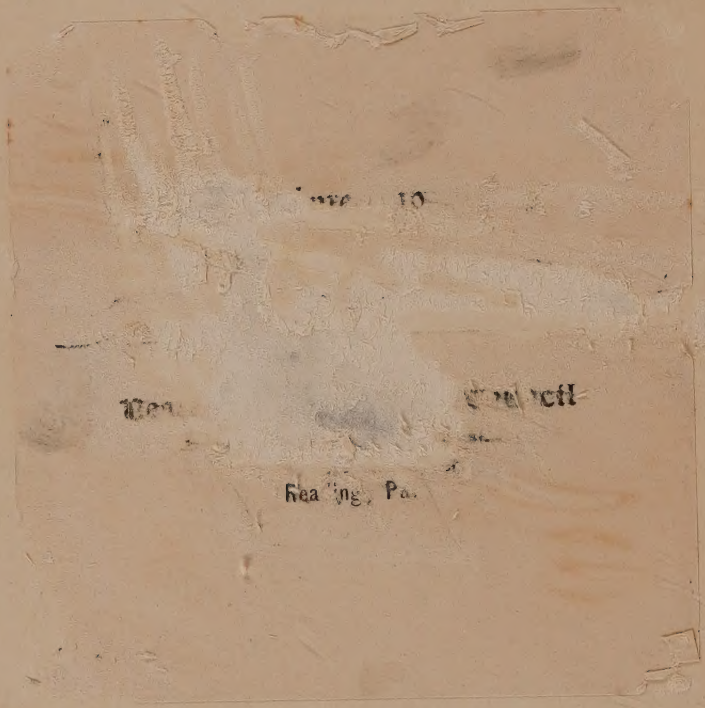
GARDEN CROPS

Production and Preservation

Lester S. Ivins



GARDEN CROPS
PRODUCTION AND PRESERVATION

FIG. 1. *A Wisconsin home garden that took first prize.*

GARDEN CROPS

PRODUCTION AND PRESERVATION

By

LESTER S. IVINS

Specialist in School and Home Gardening, Regional Director for Central States, United States Bureau of Education; also of Department of Education, Kent Ohio State Normal College; formerly State Supervisor of Agricultural Education in Ohio; author of "Agriculture in the Public Schools," "Lessons in Agriculture," "Methods, Aids, and Devices in Teaching Agriculture," "School Garden Practices in the Elementary Schools of the United States"

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To

MY FATHER AND MY MOTHER

Who secured the maximum production by cultivating every inch of space in the old home garden and who prevented waste by preserving the surplus

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THE PREFACE

Gardening has been taught for years in European schools with great success. The subject is fast finding a place in the course of study of many of the best schools of America. Its introduction is due largely to the following influences:

School officials are tending more and more to include in the courses of study such subjects as will afford children a better opportunity to prepare themselves for a well-rounded life. School patrons are asking that the schools be made more democratic by offering practical work in which the relations of cause and effect are more apparent and results more evident. The children themselves find more enjoyment in studying a subject that requires both indoor and outdoor work, which at the same time enables them to make some contribution to their own support and indirectly to the wealth of the nation. Community leaders are beginning to appreciate the great civic, hygienic, economic, and educational values that results from children having gardens and being taught the principles of gardening. These leaders point out that under these conditions part of the products are consumed where they are produced and while they are fresh, avoiding cost of transportation and handling or loss from deterioration in the market, while the part that is not consumed when fresh is saved by canning, preserving, drying, salting, and storing.

This volume is intended chiefly as a textbook for schools below the tenth grade. It is believed, however, that senior high schools or special voactional departments desiring a less advanced course in gardening than is offered in the more difficult books will find this text useful. It is also hoped that individual gardeners, members of reading or study circles, or any one

pursuing home-reading courses will find it of value. The author has endeavored to make the subject matter definite, and to present it clearly in order that it may be easily understood by children as well as adults.

If this book enables the pupil to obtain a clearer understanding of the principles involved in producing and preserving garden crops a great step will have been made toward encouraging these industries in the home. It is evident that when children understand how the home grounds or lands in their community may serve to advantage as a laboratory in which they may apply the knowledge they have gained at school, that this will result in bringing the school in to closer touch with the home life.

The text is divided into three sections. Section One discusses the production of all the most important garden crops grown in the United States and presents problems and projects for class room and outdoor work.

Section Two tells how all the crops treated in Section One may be preserved and stored. Outlines for study and for home and community work are included in most of the chapters in the first two sections.

In Section Three under "Suggestions to Teachers," the teacher will not only find help in preparing a course of study in Gardening, but also practical hints that will be useful throughout the entire course in the teaching of the subject.

This book may be used satisfactorily in all parts of the United States, especially if experienced gardeners are consulted in connection with the study of Chapters XV and XVI which treat of the dates or time for planting in all sections of the country, and Chapter VII on "Varieties of Crops."

LESTER S. IVINS.

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SECTION ONE

SUGGESTIONS TO TEACHERS

FIG. 2. *One of the first school gardens in America. Patterson School, Dayton, Ohio.*

GARDEN CROPS

CHAPTER I

SELECTING THE GARDEN SITE

The selection of a proper location for the garden is an important matter. It sometimes happens that the gardener has but one available site. In that case the space should be used, if it is at all suitable for vegetable or fruit crops.

Where a home has considerable ground connected with it from which a site may be selected, there are certain things that should be taken into account before marking off the garden. Two of these considerations are the *soil* and the *location*.

Soil. We have found by experience that most of our vegetables and fruit crops can be grown on many different types of soil. This fact should encourage every one to try to produce a sufficient supply of vegetables and fruits for the entire year.

Even though garden and fruit crops may be successfully grown in many different varieties of soil, when there is opportunity for selection some gardeners prefer one type to another. If part of the land that may be used is somewhat sandy it should be selected for the garden. The reason for this is that sandy soils dry out earlier in the spring; therefore they become warm and can be worked earlier than clay and many other kinds of soil. Since sandy soil can be worked earlier and is warmer, we are able to

produce earlier crops on this type of soil. At the same time, soils that contain a considerable amount of sand require less effort to put them in proper condition for planting. Such soils respond readily to applications of fertilizers, can be tilled soon after a rain, and are not injured by the tramping that is necessary in harvesting crops while the soil is wet. Yet if soils contain too much sand, unless some artificial method of supplying water is provided, the crop may be injured from lack of moisture during the dry season.

If the only available garden space is of a clayey nature the ground may be improved by the use of lime, stable and commercial fertilizers, or green crops that supply humus. If clayey or heavy soils are wet they can be improved by tile drainage. These different methods of improving the soil will be discussed in later chapters.

Location. If possible select a gentle southern slope. This location will give the garden the most direct exposure to sunshine, afford natural drainage, and protect it from cold north winds. These conditions are especially favorable for an early garden. The garden site should be in an open place, that is, it should be free from trees which would shade the plants and also deprive them of plant food and moisture. The site should be as near the home as possible (Fig. 1). This will permit the gardener to use many odd moments in his garden. It will also make watering an easier task if garden hose is used and water plugs are available on or near the house. A site so located that it is protected from chickens and dogs is also to be preferred. If the gardener has the choice of several sites he should select the one most attractive to the eye, provided it possesses all the other requirements.

When a late garden is desired the location selected should be low and flat with rich soil, which will be more likely to afford ample moisture during a dry season.

We learn to garden by gardening. For this reason select the best site available and then improve it as rapidly as possible. This may require study but the effort is always worth while.

STUDY OUTLINE

1. What are two important points to consider in the selection of a garden site?
2. What kind of soil is especially good for a garden?
3. Give five advantages of a garden site that contains a considerable amount of sand.
4. Name four ways in which a clay soil can be made better for a garden site.
5. State three advantages of a southern slope for a garden site.
6. Name four points that should be considered in securing a proper location for a garden site.
7. Name two points to consider in selecting a site for a late garden.

HOME AND COMMUNITY WORK

Visit two or three garden sites near your home and be prepared to discuss the following with regard to each:

1. Kind of soil.
2. What, if anything, has been done by the owner to improve the site?
3. Is the site shaded by trees?
4. In what direction does the ground slope?
5. Has the site any means of protection from dogs, chickens, or other agents of destruction?

CHAPTER II

MAKING GARDEN PLANS

I. ONE-CROP PLAN

Garden crops dependent upon site and plan. When people are considering building a home or factory the plans for the building should be taken up after the site is selected. These plans must be made to meet the special conditions or requirements, as well as the taste of the persons who are

FIG. 3. *A well-planned garden. Here the crops are planted in rows eight inches apart and the rows are marked to show just where each crop and each variety has been planted.*

to live in the home or to operate the factory. After a boy or girl has chosen the location for a garden according to suggestions received from his teacher, the garden supervisor, or his parents, the next thing is to plan the garden so that the greatest possible amount of produce may be grown upon the area selected.

Advantages of planting in rows. Making garden plans is an interesting school exercise. It will teach the child to approach a problem in a scientific manner. When planning a garden remember that it is better to plant in straight rows (Fig. 3) than in odd-sized beds or patches. Planting in rows permits the gardener to cultivate the crops more easily and much more thoroughly. In large garden areas it also makes possible the use of horse-drawn implements.

1. VEGETABLE GARDENS: ONE-CROP PLAN

A. Size: 15 ft. x 20 ft.

Inches	Crops	Rows
12	Beans, early dwarf	1
12	Beans, early dwarf	2
12	Beans, early dwarf	3
12	Beans, early dwarf	4
6	Onion sets	5
6	Onion sets	6
6	Lettuce (from seed)	7
6	Lettuce (from seed)	8
12	Beets, early (with rad.)[1]	9
12	Beets, early (with rad.)[1]	10
12	Lettuce (plants if possible)	11
12	Carrots, early (with rad.)[1]	12
12	Parsnips (with rad.)[1]	13
12	Turnips, early	14
12	Turnips, early	15
12	Peas, early	16
12	Peas, early	17
	Tomatoes	fence

[1] Rows marked with radishes. Early [button radishes are most suitable] for this purpose.

B. Size: 20 ft. x 30 ft.

Inches	Crops	Rows
12	Beans, early dwarf	1
12	Beans, early dwarf	2
12	Beans, ,, ,, (2 wks. later)	3
12	Beans, late dwarf	4
6	Onion sets	5
6	Onion sets	6
6	Parsnips (with rad.)[1]	7
6	Parsnips (with rad.)[1]	8
12	Beets, early (with rad.)[1]	9
12	Beets, later (with rad.)[1]	10
24	Lettuce (plants if possible)	11
24	Lettuce (2 weeks later)	12
12	Spinach	13
24	Peas, early	14
24	Peas, early	15
24	Peas (2 weeks later)	16
24	Peas, late	17
24	Turnips, early	18
24	Tomatoes, early	19
24	Tomatoes, early	20
24	Tomatoes, late	21
12	Peppers	22

The use of the wheel hoe or horse-drawn cultivator keeps the soil in better condition than the hand hoe alone.

The arrangement shown in the preceding table will be useful in planning a garden where the space for growing vegetables is very limited. The figures at the left in both plans indicate the distance in inches the rows are apart; the figures at the right indicate the number of the row. A record should be made of the crop and variety planted in each row. In the smaller garden tomatoes may be grown along the fence.

II. A SUCCESSION OF GARDEN CROPS

Succession cropping. When gardens are planned and planted so that early crops are followed by later ones in

2. VEGETABLE GARDENS: DOUBLE-CROP PLAN

A. Size: 25 ft. x 30 ft.

Flowers or a vine crop			Fence
Inches	First Crop	SEASON'S CROPS — Second Crop	Rows
12	Onion sets	TOMATOES	1
12	Onion sets		2
12	Beets, early	TOMATOES	3
12	Beets, early		4
18	Lettuce, early	TOMATOES	5
12	Carrots	WINTER RADISHES	6
18	Peas, early	CELERY	7
24	Peas, early	CELERY	8
24	Peas, early	CELERY	9
12	Beans, dwarf	PARSNIPS	10
12	Beans, dwarf	PARSNIPS	11
12	Beans, early string	TURNIPS	12
12	Beans, early string	TURNIPS	13
12	Beans, early string	TURNIPS	14
12	Radishes or spinach	LATE CABBAGE	15
12	Radishes or spinach		16
18	Radishes or parsley	LATE CABBAGE	17
18	Potatoes, early	NAVY BEANS	18
18	Potatoes, early	NAVY BEANS	19
18	Potatoes, early	NAVY BEANS	20

succession the system is called *succession cropping*. By carefully planning the varieties of vegetables and their planting time the succession of crops will be almost unbroken and the supply of vegetables ample and continuous throughout the season. Plans A and B of table 2 illustrate a double-

2. VEGETABLE GARDENS: DOUBLE-CROP PLAN

B. Size: 50 ft. x 60 ft.

Inches	First Crop	SEASON'S CROPS	Second Crop	Fence Rows
	Flowers or a vine crop			
18	Onion sets		SWEET CORN	1
18	Onion sets			2
18	Lettuce		SWEET CORN	3
18	Beets, early			4
18	Beets, early		SWEET CORN	5
18	Peas, early			6
18	Peas, early		SWEET CORN	7
24	Beans, bush			8
24	Beans, bush		LATE CABBAGE	9
24	Beans, bush			10
18	Carrots, early		LATE CABBAGE	11
18	Carrots, early			12
18	Radishes		LATE CABBAGE	13
30	Potatoes, early		WINTER RADISHES	14
30	Potatoes, early		TURNIPS	15
30	Potatoes, early		TURNIPS	16
30	Potatoes, early		TURNIPS	17
30	Potatoes, early		TURNIPS	18
18	Spinach		TOMATOES	19
18	Spinach			20
24	Spinach		TOMATOES	21
24	Parsley			22
24	Turnips, early		LIMA BEANS, POLE	23
12	Turnips, early			24
12	Turnips, early		LIMA BEANS, POLE	25
18	Onions from seed			26
	PERMANENT CROPS			
48	Asparagus bed	Rhubarb	Winter onions	27

crop system, that is, where an early crop is to be followed by one late crop.

In the southern part of the United States this plan could

be modified and three or four crops a year could be grown. The practice of planting the same vegetables at intervals of ten days or two weeks to make a long succession, further illustrates succession cropping.

A much larger production can be secured from a given space by succession cropping than by following the single-crop plan.

As in the first table, the figures on the left in both plans indicate the distance in inches the rows are apart, and the figures at the right the number of the rows.

Gardens of the larger size permit greater space between the rows and therefore easier cultivation.

Turnips do not require rows but may be sown broadcast.

Plan B illustrates the proper location of three permanent crops, asparagus, winter onions (multipliers), and rhubarb, and also shows succession crops (page 27).

Always keep your garden plans for reference throughout the season. You may forget the crop or variety planted in certain rows or sections of the garden.

It is impossible to show by diagram in the few pages available all possible combinations for succession planting. For this reason we give below two lists of crops, showing early crops which may be followed by others and late crops which may follow others. By having these lists at hand the gardener may arrange the crops for succession cropping in any combination that he desires.

Early crops which may be followed by others:

Bush beans	Carrots	Peas	Spinach
Early beets	Early corn	Early potatoes	Turnips
Early cabbage	Lettuce	Radishes	

Late crops which may follow others:

Late beets	Cauliflower	Kale	Turnips
Brussels sprouts	Celery	Peas	
Late cabbage	Sweet corn	Spinach	

Other vegetables may be planted at frequent intervals during the summer, thus furnishing a continuous supply of vegetables throughout the growing season. The following is a list of some garden crops which may be planted at intervals of ten days.

Crops which may be planted at ten-day intervals:

Lettuce	Dwarf beans	Spinach	Early beets
Peas	Early turnips	Radishes	Early corn

III. VEGETABLES AND SMALL FRUITS FOR THE GARDEN

Garden fruits. Small fruits should, like vegetables, be planted in rows so they may be cultivated easily. If the garden space is limited, some small fruits may be planted along the fence.

In table 3 the small fruits, including strawberries, blackberries, raspberries, currants, gooseberries, and grapes, are placed on one side while the most common vegetable perennials or permanent crops, including asparagus, winter onions, rhubarb, and horse-radish, are on the other side.

The figures at the left indicate the distance in inches the rows are apart; the figures on the right the number of the row. The number of rows of both vegetables and small fruits may be increased or decreased in proportion to the size of the available site.

Where quarter-acre plots, or larger, are available for garden sites the distance between the rows may be increased

3. Garden Plan for Vegetables and Small Fruits Size: 78 ft. x 120 ft.

	6 ft.	8 ft. Hotbed	12 ft. Cold frame	16 ft. Seed bed	Asparagus	Winter onions	Rhubarb	Horse-radish	
Inches	First Crop			SEASON'S CROPS			Second Crop		Rows
18	Onion sets						SWEET CORN		1
18	Onion sets								2
18	Lettuce						SWEET CORN		3
18	Beets, early								4
18	Beets, early						SWEET CORN		5
18	Peas, early								6
18	Peas, early						SWEET CORN		7
24	Beans, bush								8
24	Beans, bush						CABBAGE, LATE		9
24	Beans, bush								10
18	Carrots, early						CABBAGE, LATE		11
18	Carrots, early								12
18	Radishes, early						CABBAGE, LATE		13
30	Potatoes, early						WINTER RADISHES		14
30	Potatoes, early						TURNIPS		15
30	Potatoes, early						TURNIPS		16
30	Potatoes, early						TURNIPS		17
30	Potatoes, early						TURNIPS		18
18	Spinach						TOMATOES		19
18	Spinach								20
24	Spinach						TOMATOES		21
24	Parsley, salsify, parsnips in proportion of 1, 3, and 6								22
24	Turnips, early						BEANS, POLE LIMA		23
12	Turnips, early								24
12	Turnips, early						BEANS, POLE LIMA		25
12	Onions (old) for early sprouts								26
12	Onions (old) for early sprouts						WINTER RADISHES		27
				SMALL FRUITS					
60	Strawberries	Blackberries		Raspberries	Currants	Gooseberries	Grapes		28
60	Strawberries	Blackberries		Raspberries	Currants	Gooseberries	Grapes		29
60	Strawberries	Blackberries		Raspberries	Currants	Gooseberries	Grapes		30
60	Strawberries	Blackberries		Raspberries	Currants	Gooseberries	Grapes		31
60	Strawberries	Blackberries		Raspberries	Currants	Gooseberries	Grapes		32

if desired. If this is done horse-drawn implements may be used to greater advantage in cultivating. The larger garden sites afford opportunity for planting a greater variety of garden crops and also make possible a better system of succession and companion cropping.

STUDY OUTLINE

1. State the next important step after the selection of the garden site.
2. Why is it better to plant in rows rather than in beds or patches?
3. What is meant by succession crops?
4. Is the succession-crop plan better than the one-crop plan? Give your reason.
5. Name ten crops that can be followed by other crops.
6. Name ten crops that may follow other crops.
7. Name five crops that can be planted at ten-day intervals to secure a continuous supply of vegetables.
8. Is it an advantage to keep the garden plans throughout the season? State reasons.
9. Name six small fruits that may be included in a home garden.
10. Name four perennials or permanent crops that may be included in a home garden.

HOME AND COMMUNITY WORK

1. Visit two neighbors and draw plans of their gardens.
2. Tell the arrangements each has made for succession planting.
3. What crops do they grow that may well be planted at ten-day intervals?
4. Name four of their crops that might be followed by later ones.
5. Were there any small fruits in their gardens? If so, name them.
6. What perennials were included in their gardens?
7. What crops were planted in rows?
8. If there were any crops planted in beds or patches, tell what they were.

CHAPTER III

COMPANION CROPS

Growing two or more crops together at the same time on the same land is called *companion cropping*. This method of gardening is followed in order that all garden space may be utilized throughout the growing season.

How to utilize garden space. Some common examples of utilizing garden space by companion cropping are the following:

1. Slow growing plants such as melons, cabbages, and cauliflower, occupy only a small space for several weeks after

FIG. 4. *A gardener who has the right idea. This seven-year-old boy is wasting no space in his garden. Notice its flourishing condition.*

planting. Therefore a few rows of early radishes, lettuce, or turnips may be grown between the hills or rows.

2. The plan of marking rows of beets, parsnips, or carrots with radishes or lettuce, as already suggested (table 1, page 25), is a common example of companion cropping. For this purpose the early button radishes should be used. They come up quickly and make possible the early cultivation of the companion crop.

FIG. 5. *Companion cropping in practice. In this garden spinach is seen growing in rows between peas and carrots, leaf lettuce between carrots and beets, onions between beets and parsnips.*

3. Many gardeners set lettuce plants between rows of early potatoes, tomatoes, or corn; spinach between rows of peas and carrots; onion sets between beets and parsnips, and leaf lettuce between rows of carrots and beets (Fig. 5).

4. If pole beans are planted in the hills with sweet corn

or field corn or near single sunflower plants, the stalks will furnish support for the bean vine.

5. Pumpkins may be planted in the corn rows, especially in large gardens.

6. When melon or cucumber hills are eight feet apart each way, plant two or three rows of early bunch beans between the rows or hills. Pick the beans as soon as they are ready for table use and then pull up the stalks.

7. As soon as early potatoes begin to reach maturity and the vines show signs of turning brown, plant an early variety of sweet corn, or sow turnip seed between the potato rows.

STUDY OUTLINE

1. What is companion cropping? Tell the advantages of this method of gardening.

2. Name ten examples of companion cropping.

HOME AND COMMUNITY WORK

1. Have you made plans for companion cropping in your home garden? If so, explain them.

2. Visit two gardens in the neighborhood and make an outline plan of each. If companion cropping is followed indicate the crops.

CHAPTER IV

ROTATION OF GARDEN CROPS

Growing different garden crops on the same ground in successive years so that the crops follow one another in regular order is called *crop rotation.* A rotation in which corn is planted the first year, potatoes the second year, and some crop of the clover family the third year, is known as a three-year rotation. Many gardeners make the mistake of planting the same crop year after year in exactly the same spot and then wonder why the yield is poor or their soil less productive than it once was.

Advantages of crop rotation. Experienced gardeners have found that the following are some of the advantages of crop rotation:

1. Potato scab is eliminated by changing potatoes to a new location in the garden (Fig. 6).

2. Club root, a disease to which cabbages are subject, may be avoided by planting cabbages in a different part of the garden and putting something else in their place.

3. Rotation makes it possible to take plant food from different soil depths. Potatoes, onions, and beets secure nourishment from the first six inches of the soil. When these crops are followed by sweet corn the plant food is secured from a greater depth because corn roots are longer.

4. Rotation results in better crops (Fig. 7).

5. By rotating crops a greater variety of vegetables is produced and labor is distributed throughout the year.

6. If we grow only one crop the ground will be bare part of the year, while a variety of crops keeps the soil covered for a longer period.

7. Weeds which prove very troublesome to some garden crops, such as onions, may be entirely eliminated from the garden if the same space is planted with sweet corn and then more thoroughly cultivated.

FIG. 6. *A white grub working in a diseased potato. Crop rotation might have saved this potato.*

8. Generally speaking, it is well to select now and then a new location for the entire garden if space is available. By so doing many plant diseases and insect pests will disappear.

STUDY OUTLINE

1. What is meant by rotation of crops?
2. Name five advantages of rotation.

HOME AND COMMUNITY WORK

Visit two gardens in the neighborhood and be prepared to answer the following:

1. What crops have been planted this year in each garden?
2. Name the crops that were planted last year in the space occupied by each of these crops.
3. If possible, learn what crops were planted two years ago in the space at present occupied by each vegetable.
4. What garden pests and plant diseases were most troublesome two years ago? What ones were most troublesome last year?

CHAPTER V

PURCHASING GARDEN SEED

Home-grown seeds preferable. It is always best to use your own garden seeds if they have been selected with care from strong, healthy plants, and have been properly stored and carefully tested. When certain varieties of seeds have been grown and have proved satisfactory, purchasing unknown kinds would be taking a risk that might result in a complete failure of the crop.

Many gardeners find it necessary to purchase the greater part of the seed they use. When doing this care should be taken to secure varieties that have proved successful in the community. The names of tested kinds may easily be secured by consulting a successful gardener in the neighborhood.

FIG. 7. *The New York school children who grew these fine potatoes planted a standard variety.*

Standard varieties. Those varieties of seeds which have produced satisfactory crops for a certain period of years are known as *standard* (Fig. 7). It is always highly desirable to plant standard varieties of all vegetables and fruits because they are more likely to continue to yield the same quality of products as their ancestors.

All seed should be purchased from a reliable dealer, or a person who has had experience in producing and caring for

good seed. A reliable seed house makes it a business to sell seeds from well-tested varieties. When these special varieties have become well established every principle known to science is practiced to keep the seed pure. In addition every effort is made to see that the seeds are properly stored and protected from mice.

Buying seed in small packets. It is less expensive to purchase seed in large quantities and divide them into small individual portions than it is to buy separate packets. But dividing quantities of seed requires time, and unless each portion is weighed all persons may not get an equal quantity. Many gardeners are of the opinion that seed is saved by purchasing it in small packets since in many varieties only a small number of seeds is needed. This is especially true where the garden is small and seeds of several kinds of crops are to be planted.

STUDY OUTLINE

1. What points should be considered when you wish to use your own seed for planting?
2. What are standard varieties? Tell how they are produced.

HOME AND COMMUNITY WORK

1. Visit five gardens in the community and ask how many of the gardeners grow their own seed.
2. Find out if they prefer home-grown seeds to those purchased from the store.
3. If possible, learn from whom they secured the best seeds.

CHAPTER VI

ECONOMY IN THE USE OF SEEDS

One of the most valuable lessons a gardener can learn is economy. Great care should be exercised with regard to the quantity of seed purchased for the garden. No seed should ever be wasted. Purchasing a larger quantity of seed than is necessary is wasteful. Planting seeds too thick is also wasteful and should be avoided.

With these facts in mind, purchase only such seeds as your garden plan calls for (Chapter II). Seeds for future plantings should always be kept in dry, well-ventilated containers so that mice cannot get at them and destroy them.

QUANTITY OF SEED NECESSARY FOR A FAMILY OF FOUR

Vegetables	Quantity	Vegetables	Quantity
Bean, bush lima	1 pint	Melon: watermelon	1 ounce
Bean, pole lima	1 pint	Onion sets	4 to 6 quarts
Bean, snap	1 to 2 quarts	Pea	4 to 6 quarts
Beet	4 ounces	Parsley	1 packet
Cabbage, early	1 packet	Parsnip	½ ounce
Cabbage, late	½ ounce	Radish	1 ounce
Carrot	1 ounce	Salsify	1 ounce
Cauliflower	1 packet		
Celery	1 packet	Spinach (in spring)	¼ ounce
Corn, sweet	1 to 2 pints	Spinach (in fall)	½ pound
Cucumber	1 ounce	Squash, Hubbard	1 ounce
Eggplant	1 packet	Squash, summer	1 ounce
Kale	2 ounces	Tomato, early	1 packet
Lettuce	½ ounce	Tomato, late	¼ ounce
Melon: muskmelon	1 ounce	Turnips	2 to 3 ounces

Estimating quantity of seed. The United States Department of Agriculture in its *Farmers' Bulletin 934* suggests that the quantities of the various kinds of seed given in the

foregoing table will be sufficient for a family of four persons. Taking these as a basis, a gardener can estimate the quantity of seed he will need, and purchase it before planting time arrives. Such a calculation is a splendid school exercise. It makes arithmetic a live subject in the minds of the pupils who have such practical problems to solve.

Fresh vegetables all summer. Young gardeners must not forget the importance of successive planting throughout the season, so that fresh vegetables may be available for the family at all times.

STUDY OUTLINE

1. Why should we avoid wasting seed?
2. How can we do so?
3. Name five garden crops; give the quantity of each kind of seed required to plant a garden for a family of four.

HOME AND COMMUNITY WORK

1. Find out from three persons in the community how much of each kind of seed they purchased for last year's garden.
2. In each instance how does the quantity compare with that given in the table?

CHAPTER VII

VARIETIES OF CROPS

The varieties of garden crops mentioned in the following table have proved dependable for home and school gardens throughout many parts of the United States. Check this list with an experienced gardener in your locality. Occasionally local soils and climatic conditions, as well as market demands, might make it desirable to use different varieties from the ones suggested here.

1. VEGETABLES

Name	Variety
Beans, green bush	Stringless; Green Pod; Red Valentine
Beans, green pole	Kentucky Wonder
Beans, bush lima	Landreth; Burpee's Bush
Beans, pole lima	Seidert; Ideal
Beets, red	Crosby's Egyptian; Detroit Red
Cabbage, early	Jersey Wakefield; Copenhagen
Cabbage, late	Flat Dutch; Danish Ball Head
Carrots	French Forcing; Half Long Scarlet
Celery	Easy Blanching; Columbia
Corn, sweet	Country Gentleman; Golden Bantam
Cucumbers	Emerald; White Spine
Lettuce, leaf	Grand Rapids; Blackseeded Simpson
Lettuce, head	Big Boston; May King
Onion sets	White Silverskin
Onions, dry	Yellow Globe; Silver King
Parsley	Plain Leaved; Moss Curled
Parsnip	Hollow Crowned; Sugar
Peas	Telephone; American Wonder
Potatoes, early	Early Ohio; Irish Cobbler; Early Rose
Potatoes, late	Burbank; Sir Walter Raleigh
Radishes, early	Scarlet Globe; Short Top
Radishes, summer	White Icicle
Radishes, winter	Japanese
Tomatoes	Red Rock; Jewel; Bonny Best
Turnips, white	White Globe; Purple Top Globe

2. Small Fruits, Etc.

Name	Variety
Strawberries, everbearing (bisexual)	Progressive; Superb
Strawberries, ordinary (bisexual)	Lady Thompson; Tennessee
Strawberries (pistillate)	Crescent; Warfield
Blackberries, early	Early King; Eldorado
Blackberries, late	Success; Taylor
Raspberries, red	Marlboro; Herbert; King
Raspberries, black	Ohio; Black Diamond
Raspberries, purple-cane	Shaffer; Columbian
Currants, red	Red Dutch; Cherry
Currants, white	White Dutch; Grape
Currants, black	Black Naples
Gooseberries, American	Houghton; Downing
Gooseberries, English	Triumph; Industry
Grapes	Concord; Delaware

STUDY OUTLINE

1. Name ten common vegetable crops.
2. Name two varieties of each crop.
3. Name five small-fruit crops.
4. Name two varieties of each crop.

HOME AND COMMUNITY WORK

1. What vegetables and fruits were grown in your home garden last year?
2. Name each variety that you grew.
3. Visit three gardens in your community and make a list of all the crops grown in each and the variety of the crop produced.

CHAPTER VIII

HINTS ON PLANTING

The successful gardener, before starting on the season's work, secures all the information he can get. Subjects of special interest to him are: Kinds of vegetables, quantity of seed or number of plants required for his garden, planting distances, depth of planting, days required for germination of seed, average time of maturing, and average life of the seed of each kind of vegetable. All these things are important to the gardener. In selecting vegetable varieties care must be used to get those that do best in the locality, and for the surplus of which a nearby market affords an outlet.

Planting distances. The number of plants or the quantity of seed required for a row depends upon the distance between the plants (Fig. 8). This, as well as the distance between rows, is determined by:

1. The character of root growth; planting distances differ for corn and beets because of the difference in root growth, corn roots being much the longer.

2. Top growth, as in lettuce and tomatoes.

3. Fertility of the soil; some crops, such as onions and celery, require a much more fertile soil than others—beans, for instance, which will grow in almost any soil.

4. Character of growth; melons require more space than cabbages, because of their tendency to vine.

5. Germinating power of seeds; some seeds germinate under almost any reasonable conditions of soil and climate, while others need care and attention.

Planting depths. The depth at which the seed should be planted is determined by:

1. Size of seed.
2. Habit of plant.
3. Quality of soil, whether warm or cold, heavy or light.
4. Time of year.

Things that affect seed. The gardener should realize that many agencies combine to influence the germination,

FIG. 8. *These boys are not planting their potatoes by chance. They have learned that potatoes should be planted 3 or 4 inches deep, and in straight rows 2 to 2½ feet apart.*

maturity, and life of seeds. For this reason, the exact length of time required for these cannot be determined. For

example, soil and climatic conditions have an influence on the germination and maturing of seed. The life of the seed may depend upon their state of maturity at harvest time, or the conditions under which they are stored. Although seed may be in good condition to plant after several years of storage, it is not at all safe to depend upon old seed.

Since this information is of interest to so many it has been arranged in a convenient form known as "gardeners' planting tables" which follow.[1]

GARDENERS' PLANTING TABLE I

Vegetable	Seeds or plants required for 100 feet of row space	Planted apart in rows	Depth of planting
Beans, bush	1 pint	5 to 8 inches	½ to 1 inch
Beans, pole	½ pint	3 to 4 feet	1 to 2 inches
Beets	2 ounces	5 to 8 inches	1 to 2 inches
Cabbage, early	¼ ounce	12 to 18 inches	½ inch
Cabbage, late	¼ ounce	16 to 24 inches	½ inch
Carrot	1 ounce	6 to 10 inches	½ inch
Celery	¼ ounce	4 to 8 inches	⅛ inch
Corn, sweet	¼ pint	30 to 36 inches	1 to 2 inches
Cucumber	½ ounce	4 to 6 feet	1 to 2 inches
Lettuce	½ ounce	4 to 6 inches	½ inch
Muskmelon	½ ounce	Hills 6 feet	1 to 2 inches
Watermelon	1 ounce	Hills 10 feet	1 to 2 inches
Onion seed	1 ounce	4 to 6 inches	½ to 1 inch
Onion sets	1 quart	4 to 8 inches	1 to 2 inches
Parsnips	½ ounce	5 to 8 inches	½ to 1 inch
Peas	1 to 2 pints	15 to a foot	2 to 3 inches
Pepper	⅛ ounce	15 to 18 inches	½ inch
Potato, Irish	5 pounds	14 to 18 inches	4 inches
Radish	1 ounce	8 to 12 feet	½ to 1 inch
Rhubarb seed	½ ounce	6 to 8 inches	½ to 1 inch
Rhubarb plants	33 plants	3 feet	2 to 3 inches
Rutabaga	¼ ounce	6 to 8 inches	½ to 1 inch
Salsify	1 ounce	2 to 4 inches	½ to 1 inch
Spinach	1 ounce	7 or 8 to a foot	1 to 2 inches
Squash, bush	½ ounce	Hills 3 to 4 feet	1 to 2 inches
Squash, late	½ ounce	Hills 7 to 9 feet	1 to 2 inches
Tomato	⅛ ounce	3 feet (plants)	½ to 1 inch
Turnip	½ ounce	6 to 7 to a foot	¼ to ½ inch

[1]Part of the information in these tables is taken from *Farmers' Bulletin 818*.

GARDENERS' PLANTING TABLE II

Vegetable	Usual time of germination in days	Ready for use after planting in days	Average time in years that seeds retain vitality
Beans, bush	7 to 10	40 to 65	3
Beans, pole	7 to 10	50 to 80	3
Beets	8 to 14	60 to 80	6
Cabbage	7 to 10	80 to 125	5
Carrots	13 to 18	80 to 110	4
Cauliflower	8 to 10	90 to 125	5
Celery	10 to 15	125 to 150	8
Corn, sweet	4 to 8	60 to 100	10
Cucumbers	8 to 10	60 to 80	10
Lettuce	7 to 10	60 to 90	5
Onions	10 to 12	125 to 150	2
Peas	6 to 9	40 to 75	3
Parsnips	12 to 20	125 to 150	2
Radishes	5 to 6	20 to 40	5
Tomatoes	7 to 10	100 to 150	4
Turnips	6 to 8	60 to 90	5

STUDY OUTLINE

1. Give quantity of seed needed for 100 feet of row space for the ten vegetables with which you are most familiar.
2. Give depth the seed of each should be planted.
3. What is the average time before each of these ten vegetables is ready for table use?
4. State the average life in years of the seeds of each.
5. What is the usual time required for the germination of each kind of seed.

HOME AND COMMUNITY WORK

1. Visit three home gardens near your school or residence and learn what vegetables were grown in them last year.
2. Find out the quantity of seed used for each crop; the length of the rows.
3. How does the quantity used compare with that given in the table?
4. Germinate seeds of different ages. Note results.

CHAPTER IX

DRAINING THE GARDEN

Natural drainage. When the garden site contains gravel or has a sandy soil it is said to have *natural drainage*. If the garden is on a slope the surplus water will drain off.

Artificial drainage. If the garden is low and flat and has a heavy clay soil it will need *artificial drainage*. Artificial drains should be put in before the seed bed is prepared.

If garden plants are to grow and reach their best development they must have a well-drained seed bed. For growth roots require air as well as water (Fig. 9). They cannot find the proper amount of air if the soil contains too much water. This surplus soil moisture is sometimes called *gravitational* water. It excludes the air which the plant roots need. It is also gravitational water that fills our wells or springs.

The water that does not run off either by natural or artificial drainage is known as *capillary* or *film* water. It is capillary or film water that the roots of plants make use of.

Tile drains. When properly placed tile drains are beneficial because they carry off the gravitational water and thus provide more air for the roots, warm the soil, make tillage easy, reduce injury due to dry weather, promote germination of seeds, reduce surface wash, permit earlier working of the soil, and make possible a deeper root system.

Open trenches. If the garden is small and the gardener does not care to go to the expense of putting in tile drains, open trenches will do some good. These trenches are made with a spade, shovel, or plow. They are usually located on

both sides or ends of the garden and occasionally through the middle also. If the garden is large an open trench 18 to 24 inches deep may be made every 30 or 40 feet.

Filling to avoid drainage. In a small garden it is often less expensive and more convenient to fill in low ground

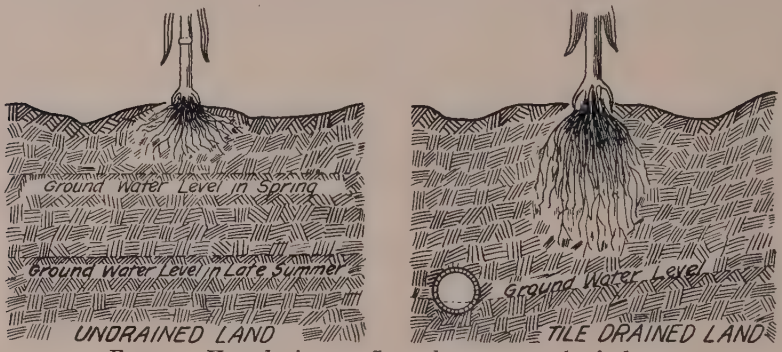


FIG. 9. *How drainage affects the root growth of plants.*

rather than to put in tile drains or dig surface trenches. When this is done, good loam, wood's dirt, or a sandy soil is used for filling. The low part of the garden should be covered to a depth of 3 or 4 feet. If this is not sufficient more soil must be added. Drainage, or filling of low ground, will add greatly to the value of a garden site.

STUDY OUTLINE

1. What two conditions favor natural drainage?
2. What is gravitational water? What is film water?
3. Give six advantages derived from the use of tile drains.
4. How are open trenches prepared? How do they drain the garden?

HOME AND COMMUNITY WORK

1. Visit gardens in your community and learn the method of drainage, if any, used in each. How many gardens were on natural slopes?

CHAPTER X

PREPARING THE GARDEN SOIL

Plowing and spading. If possible the garden should be plowed in the fall. If this cannot be done, very early spring plowing is advisable. Many gardens are too small to be plowed with a team. These should be spaded deeply with a spading fork. Deep plowing and spading, followed by thorough harrowing and raking, put the soil in the best possible condition for the development of the root system. When the soil is being spaded, each spadeful as it is turned over should be broken by striking it with the back of the spade. An ideal garden soil will crumble in the hands.

How to make a compost heap. Vegetables are heavy feeders and therefore they need a soil made rich by the application of stable manure. Experienced gardeners have a very high regard for compost for use upon the garden. A *compost heap* is made of a mixture of meadow sod, leaves, straw, the skin and other unused portions of food and vegetables, sweepings from unoiled streets, lime or wood ashes, stable manure, and earth. By means of the compost heap manure is allowed to rot under the most favorable conditions. The plan usually followed is to spread out first a layer of manure about four inches deep, then one of leaves or straw or vegetable waste. Upon these sprinkle a small quantity of lime or wood ashes and follow with a layer of earth an inch or two thick. Repeat the operation until all available material has thus been arranged in piles. The rainfall will probably be sufficient to prevent

the compost heap from heating. Alternate layers of leaves or straw prevent the plant food contained in the stable fertilizer and street sweepings from dissolving away or "leaching out" as the rain water filters through the heap.

FIG. 10. *Filling plant containers from the compost heap. The boy or girl who learns to make good use of the compost heap will stand a good chance of carrying off the prizes.*

Any stable or commercial fertilizer should be very thoroughly worked into the soil. This is important. A detailed discussion of garden fertilizers is given in Chapter XI.

The use of lime. Garden soils composed largely of clay are very likely to be sour. To remedy this condition apply to every 25 square feet of garden space 1 pound of air-slaked, burned, or hydrated lime, or 2 pounds of ground limestone, or 3 pounds of unleached wood ashes.

Lime, in addition to correcting acidity in the soil, improves its physical structure.

The proper preparation of the soil is of the utmost importance, and the success of the garden will very largely depend upon the thoroughness with which this work has been done.

STUDY OUTLINE

1. When is the best time to plow a spring garden?
2. How should spading be done?
3. What is an ideal garden soil?
4. Do vegetables need a rich soil? If so, why?
5. Tell how a compost heap is made.
6. How should sour garden soils be treated?
7. Besides correcting acidity of soil state another use of lime.
8. Upon what does a successful garden largely depend?

HOME AND COMMUNITY WORK

1. Has your spring garden at home ever been spaded or plowed in the fall?
2. Visit four gardeners in your community. How many have used lime and compost? State the results in each case.

CHAPTER XI

COMMERCIAL FERTILIZERS FOR THE GARDEN

Compost and manure from the stable, hen house, or pigeon loft are by far the best fertilizers for the garden. When these natural fertilizers are not available in sufficient quantities it is necessary to obtain commercial fertilizers, which are also often used as a supplement to manure.

Commercial fertilizers. The better commercial fertilizers contain plant food in a readily available form and will therefore help materially in producing a good garden crop. The three food elements most needed by plants are nitrogen, phosphorus, and potassium. The nitrogen can be supplied by means of nitrate of soda and sulphate of ammonia, which are its most common chemical sources. The most common nitrogenous fertilizers from organic sources are dried blood, tankage, fish scraps, and cotton-seed meal. The phosphorus needed for soils is supplied through chemical sources from phosphate rock and Thomas slag; through organic sources by ground raw bone, ground steamed bone, and bone black. The organic sources of potash fertilizers are unleached and leached wood ashes and tobacco stems. The chemical sources of potash are kainite, muriate of potash, and sulphate of potash. If the prices on potash from chemical sources are too high to be profitable, wood ashes may be used to supply this plant food. Besides potash, wood ashes also contain about 30 per cent of lime and therefore serve a double purpose, furnishing lime as well as a small per cent of potash.

Quantity of fertilizer to use. For a garden containing 1,000 to 1,250 square feet, 10 pounds of nitrate of soda or sulphate of ammonia and 30 pounds of acid phosphate will make a good application. The nitrate of soda or sulphate of ammonia is applied in dry form by putting half the quantity in the row at planting time after the seeds have been covered, and scattering the other half broadcast between the rows and raking it into the soil. When applying the dry fertilizers directly in the row *before* the plants come up, use 2 tablespoonfuls for 20 feet of row space. If the dry fertilizer is applied *after* the plants come up, scatter 2 tablespoonfuls along the side of each row. Do not permit the dry fertilizer to come in contact with the plants.

Another way to use fertilizers, and one often followed, is to apply nitrate of soda or sulphate of ammonia in solution after the plants are started. Use 1 tablespoonful of either of these to a gallon of cold water. Sprinkle this solution freely along the row. A gallon of this mixture should be enough for 20 feet of row space. Three applications during the growing season will probably be sufficient to insure good results on most soils. It is important to remember that the first two applications should be made early in the growing season. Apply the first solution soon after the plants appear; the second application can be added about two or three weeks later, and the third about the middle of the growing season.

These fertilizers may also be applied in solution as soon as the seeds are planted. If this is done, 2 *heaping* tablespoonfuls may be used to 1 gallon of cold water on every 20 feet of row space. The acid phosphate can be scattered

broadcast and raked in as soon as the ground is plowed. Use 3 pounds to each 100 square feet of garden space.

Stable manure is sometimes used in connection with a commercial fertilizer. A ton of this manure could be used on a garden containing 1,000 to 1,250 square feet. After spading or plowing in the stable manure add 30 pounds of acid phosphate and rake it in well as soon as the ground is plowed.

Prepared fertilizers. Most seed and fertilizer houses now sell garden fertilizers already prepared. These can be purchased in small quantities. A good garden fertilizer will contain 3 to 5 per cent of nitrogen, 2 per cent of potash, and 8 to 10 per cent of phosphoric acid. The dealer will explain the best mixtures for the different types of soil. Most gardeners count on using about 5 pounds of the above grade of commercial fertilizer for each 100 square feet of garden space.

A little study of the best methods of using commercial fertilizers on his garden will yield any gardener a splendid reward for the time thus spent.

STUDY OUTLINE

1. What three chemical elements are most necessary to plant life? From what two general classes of sources are they obtained?
2. What are the most common chemical sources of nitrogen?
3. What are the most common organic sources of nitrogen?
4. What the most common chemical sources of phosphorus?
5. What are the most common organic sources of phosphorus?
6. What are the organic sources of potash?
7. What are the chemical sources of potash?
8. Tell how dry fertilizers should be applied.
9. Give proportions of fertilizers to be used in solution.

HOME AND COMMUNITY WORK

1. Visit five home gardens in your community and learn what kinds of fertilizer were used in each.

2. In applying fertilizers which form — dry or in solution — was the more popular?

3. What was the cost for each garden?

4. What fertilizers were most popular?

5. Find out the trade name and the plant food contained in the kinds which proved most successful.

CHAPTER XII

TESTING GARDEN SEED

The importance of testing garden seed cannot be overemphasized. We cannot tell by looking at seeds whether or not they will grow. The only safe way is to test them to see if the germs are alive.

Many things contribute to undermine the vitality of seeds. Among these are cold wet seasons, seasons too short for plants to mature properly, improper storage after seeds have been harvested, exposure to rodents or insect enemies which destroy them while in storage, and keeping them too long before planting.

Reliable seed houses make it a part of their business to test carefully the seeds they plant or sell. Even when this is done it sometimes happens that the vitality of seeds is injured before they are planted. Because of these and other reasons that need not be mentioned here, it is necessary for gardeners to test their seed before planting.

How to test seed. Testing seed is a simple process and may be done in any of the following ways:

1. Fill a chalk box with sand. Plant 100 seeds in the sand. Cover the box with glass and keep it in a temperature of about 70° Fahrenheit. Note the percentage of seed that germinate. Place corresponding numbers on the box and the seed package as a reminder of which package is being tested.

2. Place 100 seeds between two sheets of moistened blotting paper. Keep in a warm room and note the percentage

that germinate. Number the sheets and package to correspond.

3. Fill two small bags with sawdust and moisten them. Place 100 seeds between these bags and note the percentage that germinate. Be sure to keep the bags in a warm place. Number the bags and put the same number on the package from which the seeds were taken.

4. Cut a long strip of muslin about 12 inches wide. Mark it off into 3-inch squares, leaving about 8 inches blank at each end of the strip. Select the same number of ears of corn to be tested as you have squares on the cloth. Put a few grains from one of the ears on each of the squares and number the ears and squares to correspond. Turn the blank ends of the new cloth back over the squares of seeds and roll up the entire strip over a smooth round stick, being careful not to disarrange the seeds. Tie the ends of the roll and set it in lukewarm water for twelve hours and then keep it in a warm place for a week. This is a convenient way to germinate seeds. It is known as the "rag-doll" tester.

Determining the percentage of germination. By testing seed we determine not only the percentage that will germinate, but also the strength of the seed germ. When seeds show a very weak germ we conclude that they are not fit to plant. Most gardeners consider garden seed good to plant if the test shows that 75 per cent will germinate and produce a *strong germ*. If the percentage of germination is smaller, we must discard the entire package as unfit to plant, or sow the seed more thickly than has been suggested (Chapter VIII) in order to make up for the weak or inferior seeds. When the samples show both a low percentage of

germination and an inferior germ, the better plan is to discard the package from which the seeds were taken and get new seed. But if the seed is sown thickly it usually means that the plants will have to be thinned out later. At best the plants will be uneven and also very irregular in their growth and time of maturing. Successful gardeners always test seed before planting.

STUDY OUTLINE

1. Name three conditions that tend to undermine the vitality of seed.
2. Name several ways of testing seed. Describe each process.
3. What is determined by testing seed?
4. What per cent may be used as a minimum for deciding that seed is fit to plant?

HOME AND COMMUNITY WORK

1. State the methods most commonly used in your community for testing seed.
2. Visit five homes in your community and find out how many persons tested their garden seed last year.
3. How many had difficulty in getting a good stand of certain vegetables?
4. Did they test the seeds of these poor crops? If so, what per cent germinated?

CHAPTER XIII

THE HOTBED

Making a hotbed. A hotbed is used to produce early plants that are intended for transplanting later to the vegetable or flower garden, or to mature plants like lettuce, radishes, and onions out of season (Fig. 11). In preparing a hotbed the gardener's first problem is the selection of a site. This should be in a convenient and well-drained location. After the site is chosen the next step is to dig a pit from 2 to 3 feet deep and 6 feet wide. This pit may be made as long as the sash with which the gardener intends to cover it, but 9 to 12 feet will be long enough to produce plants sufficient for the average home garden. When the pit is ready a 2-inch plank 15 inches wide is placed on the north side of the bed and one 8 to 10 inches wide on the south. This arrangement gives the sash a southern slope. The ends of the bed are then enclosed with boards, and earth is thrown up around the entire framework to keep out cold and insure a more uniform temperature.

Hotbed sashes. In the North, the pit and the framework should be made ready in the fall. Hotbed sashes are frequently made in sections 3 feet wide and 6 feet long. These sections can easily be raised or lowered by placing hinges on the north or south plank. They can also be made to slide in and out on the strips of wood placed across the top of the bed for the sash to rest upon.

Preparing the hotbed for the plants. About ten weeks before it is time to transplant the plants to the garden the

pit should be filled with moist stable manure. This manure is covered with 5 or 6 inches of rich soil procured for that purpose in the fall. The manure ferments and heats the soil which, during this time, should be kept moist. At first the fermentation will be excessive, but after a few days this

FIG. 11. *A hotbed shielded from the wind by willows. Some of the mature plants from the hotbed have already been transplanted and are growing in this luxuriant and attractive garden.*

will stop, and the heat given off will become uniform. The hotbed is then ready for use. A thermometer should be placed in the soil so that the gardener may know when the temperature remains at about 85° Fahrenheit, which is the proper temperature for planting seeds. If the bed should get too warm after planting the seed it can be cooled

by lifting the sash a few minutes. If the hotbed has been properly constructed it will give off sufficient heat of a uniform temperature to produce plants for a period of six weeks.

The hotbed will prove a valuable addition to any garden. If the frames and sashes are kept painted and well cared for they will last many years.

STUDY OUTLINE

1. For what purposes is the hotbed used?
2. How should it be located?
3. How is the pit constructed?
4. How is the frame constructed?
5. When is the manure put in place?
6. How much and what kind of soil should be placed upon the manure?
7. Why should the gardener use a thermometer to test the temperature of the hotbed?

HOME AND COMMUNITY WORK

Visit two gardeners who have hotbeds and be prepared to answer the following questions:

1. What is the size of each hotbed?
2. What is the height of plank on the north side? on the south side?
3. On what date was the soil added to the hotbed?
4. When was the seed planted, and what kinds?
5. On what date was transplanting done?
6. Were there any vegetables matured in these beds? If so, name them.

CHAPTER XIV

THE COLD FRAME AND SEED BED

Cold frames. No manure is used in cold frames, but otherwise they are made exactly like hotbeds. The sun alone is depended upon to furnish heat for the plants. A cold frame is covered with a sash similar to that used for the hotbed. If no glass is available, heavy cotton cloth or canvas may be substituted for it. The chief object in constructing a cold frame is to have a place in which to harden plants raised in a hotbed before transplanting them to the garden. If some means were not taken to harden tender plants like the tomato, the plants would have to be taken directly from the hotbed to the open ground and probably would die. If such plants are first transplanted to a cold frame the change of temperature is not so sudden, and they are less liable to die or to be set back in growth. In some localities cold frames may also be used for growing winter lettuce and spinach as well as for storing certain tender plants over winter.

As the spring season approaches and the heat of the sun begins to increase in the middle of the day, the sash may, at this time, be raised a few inches in order to harden the plants. This also provides necessary ventilation. Later in the season the covering may be removed entirely for the greater part of the day. A few days before the plants are to be transplanted from the cold frame to the garden the sash should be removed from the frames both day and night to finish the process of hardening. In severe cold weather

both hotbeds and cold frames need additional protection against the cold. This extra protection may be provided by covering the frames or beds at night with hay, straw, or fodder.

Seed bed. Many gardeners reserve a small piece of ground at one end of the garden for a seed bed. Good soil may be secured by using one part well-rotted manure, two parts rich garden loam or wood's dirt, and one part fine sand. Compost from the compost heap, already described (Chapter X), is good to use in preparing soil for the seed bed. Mix all the ingredients thoroughly before planting the seed.

Protecting the bed against cold. In the North the seed bed should be protected against severe cold by placing over it a wooden frame covered with canvas cloth. Earth is banked up around this frame during the coldest weather. As the days begin to grow warmer the canvas can be removed from the frames so as to harden the plants. Two weeks before it is time to begin transplanting, the canvas should be removed entirely. Plants produced in this way are sometimes stronger than those produced in either the hotbed or the cold frame.

STUDY OUTLINE

1. What is the chief difference between a cold frame and a hotbed?
2. What is the principal use of the cold frame?
3. Tell how hotbeds and cold frames are protected in severe cold weather.
4. How is a seed bed made?
5. Describe the plan used in the North for protecting the seed bed.

HOME AND COMMUNITY WORK

Visit two gardeners who use either a cold frame or a seed bed and answer the following questions in regard to each:

1. On what date were the observations made?
2. What were the dimensions of the cold frame or seed bed, and what kind of soil did it contain?
3. What crops were produced in the cold frame or seed bed?

CHAPTER XV

PLANTING DATES EAST OF THE MISSISSIPPI[1]

It is said that the Indians planted corn when the oak leaves were as large as a squirrel's ear. When planting, they also gave consideration to the changes of the moon. Some of the signs used by the Indians are still observed by persons who believe in the old ways of gardening.

Deciding when to plant. To be successful a gardener must exercise good judgment in deciding upon the proper date to plant his crop. The correct date one year may be too early or too late another year. As weather conditions vary from year to year, it is wise for a young gardener to advise with an experienced gardener before deciding upon the dates for planting in any part of the country.

Planting zones. In recent years planting dates have been given much attention. Those making a study of the subject have noted that climatic conditions are similar throughout certain portions of the country. Such areas are called planting zones. The eastern part of our country has been divided into seven planting zones. On our map these zones are called A, B, C, D, E, F, G.

The dates given in the tables for planting in these seven zones are average dates that are considered best for planting; therefore dates slightly earlier or later may frequently be used with an average chance for success.

[1] Part of the information contained in this chapter was taken from the reports of the United States Weather Bureau and from bulletins of the United States Department of Agriculture.

I. EARLIEST VEGETABLE PLANTING DATES FOR THE EASTERN HALF OF THE UNITED STATES

Vegetable groups. For greater convenience in study the most common vegetables are arranged in four groups as follows:

Group 1. Vegetables that may be planted two weeks before the last killing frost:

Early cabbage[1]	Mustard	Early potatoes
Collards	Onion sets	Radishes
Kale	Early smooth peas	Turnips

Group 2. Vegetables that may be planted about the date of the last killing frost:

Beets	Celery seed	Onion seed	Wrinkled peas
Chinese cabbage	Sweet corn	Parsley	Salsify
Carrots	Lettuce	Parsnips	Spinach
Cauliflower plants			

Group 3. Vegetables that should be planted two weeks after the last killing frost:

Snap beans	Okra	Tomato plants

Group 4. Vegetables that cannot be planted until the soil is well warmed up, or about one month after the last hard frost:

Lima beans	Eggplant	Pepper plants	Squash
Cucumbers	Melons	Sweet potatoes	

Earliest planting dates. The following table shows the earliest safe dates for planting the vegetables of these four groups in the open, within the seven zones illustrated on the map (Fig. 12). These dates are based on the average dates of the last killing frost in the spring.

[1] Plants from hotbed or seed box.

PLANTING DATES BY VEGETABLE GROUPS

Zone	Group 1	Group 2	Group 3	Group 4
A.....	Jan. 1 to Feb 1.	Feb. 1 to Feb. 15	Feb. 15 to Mar. 1	Mar. 1 to Mar. 15
B.....	Feb. 1 to Feb. 15	Feb. 15 to Mar. 1	Mar. 1 to Mar. 15	Mar. 15 to Apr. 1
C.....	Feb. 15 to Mar. 1	Mar. 1 to Mar. 15	Mar. 15 to Apr. 1	Apr. 1 to Apr. 15
D.....	Mar. 1 to Mar. 15	Mar. 15 to Apr. 15	Apr. 1 to May 1	May 1 to May 15
E.....	Mar. 15 to Apr. 15	Apr. 15 to May 1	May 1 to May 15	May 15 to June 1
F*.....	Apr. 15 to May 1	May 1 to May 15	May 15 to June 1	May 15 to June 15
G*.....	May 1 to May 15	May 15 to June 1	May 15 to June 15	(†)

* For the crops grown in these zones. † Season too short for this group.

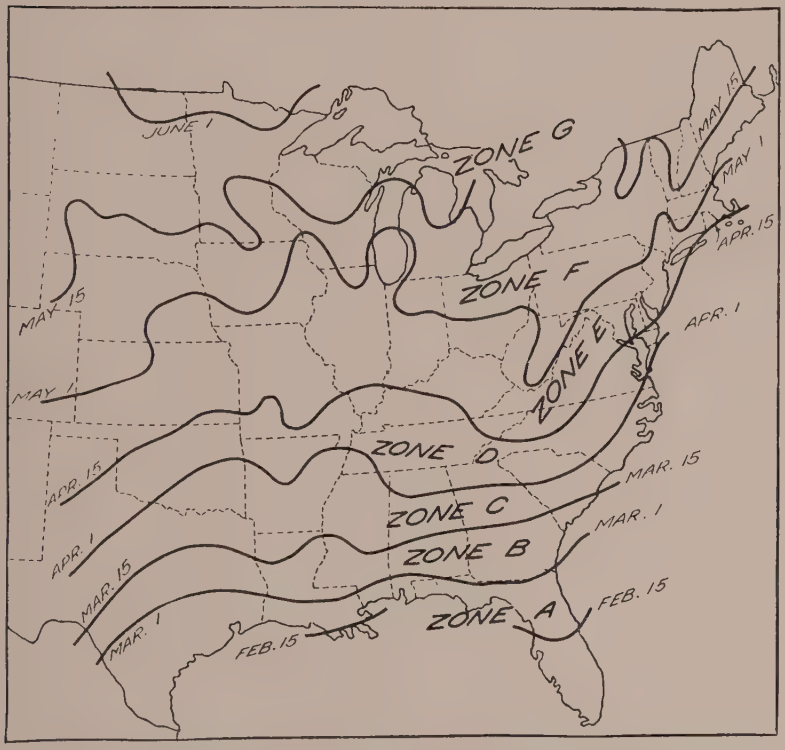


FIG. 12. *A zone map of the eastern part of the United States based on the average dates of the latest killing frosts in the spring.*

Use of the map. By referring to the map to find the zone in which he lives and then consulting the table showing the planting dates by vegetable groups, the gardener may determine the proper time within a very few days for planting any vegetable included in the four groups.

II. LATEST VEGETABLE PLANTING DATES FOR THE EASTERN HALF OF THE UNITED STATES

The following table gives the latest dates on which it is safe to plant vegetables for fall gardens in zones C to G. It is based on the accompanying map (Fig. 13).

LATEST SAFE DATES FOR PLANTING VEGETABLES FOR THE FALL GARDEN

Crop	Zone C	Zone D	Zone E	Zone F	Zone G	Days necessary for maturing in any locality.
Beans, bush	Sept. 15	Sept. 1	Aug. 15	Aug. 1	July 15	40 to 65
Beans, pole lima	Sept. 15	Aug. 1	July 15	July 1	.....	80 to 120
Beets	Sept. 15	Sept. 1	Aug. 15	Aug. 1	July 15	60 to 80
Cabbage	Sept. 1	Aug. 15	July 15	July 1	June 15	90 to 130
Carrots	Sept. 1	Aug. 15	July 15	July 1	June 15	70 to 100
Cauliflower	Sept. 1	Aug. 15	July 15	July 1	June 15	100 to 130
Celery	Oct. 1	Sept. 1	Aug. 1	July 1	May 15	120 to 150
Corn, sweet	Aug. 15	Aug. 1	July 15	July 1	June 15	60 to 100
Cucumbers	Aug. 15	Aug. 1	July 15	July 1	.....	100 to 140
Kale	Nov. 1	Oct. 1	Sept. 15	Sept. 1	Aug. 15	90 to 120
Lettuce	Nov. 1	Oct. 15	Oct. 1	Sept. 15	Sept. 1	60 to 90
Parsley	Nov. 1	Oct. 1	Sept. 1	Aug. 1	July 1	90 to 120
Peas	Nov. 1	Oct. 1	Sept. 1	Aug. 1	July 15	40 to 80
Potatoes, Irish	Aug. 15	Aug. 1	July 5	July 1	June 15	80 to 140
Potatoes, sweet	Aug. 15	July 15	June 15	May 1	.....	140 to 160
Radishes	Oct. 15	Oct. 1	Sept. 15	Sept. 1	Aug. 15	20 to 40
Spinach	Oct. 15	Oct. 1	Sept. 1	Aug. 15	Aug. 1	30 to 60
Squash, bush	Aug. 15	Aug. 1	July 15	July 1	June 15	60 to 80
Squash, vine	July 15	July 1	June 15	June 1	.....	120 to 160
Tomatoes	Aug. 15	July 15	July 1	June 15	.....	80 to 125
Turnips	Oct. 15	Oct. 1	Sept. 1	Aug. 1	July 15	60 to 80

In zones A and B many vegetables are planted late in the fall for the winter or early spring garden. The dates for

planting are based on the average dates of the first killing frosts in the fall. The period necessary for maturing each vegetable is indicated in the foregoing table.

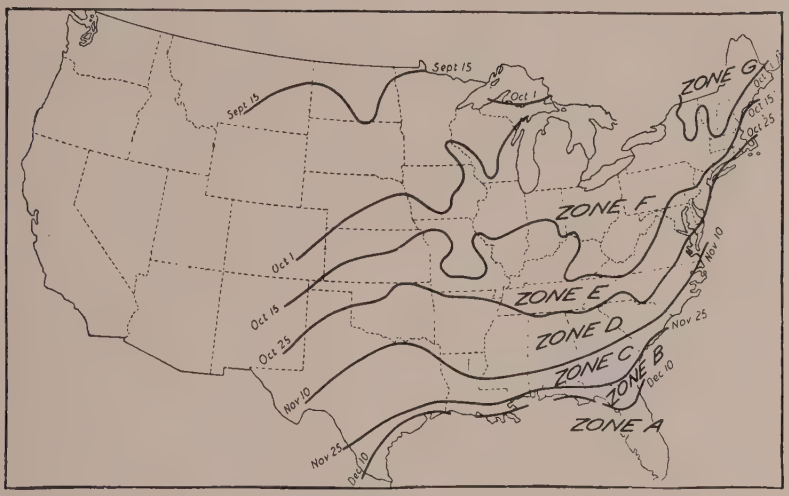


FIG. 13. *A zone map of the eastern part of the United States based on the average dates of the first killing frost in the fall.*

CHAPTER XVI

PLANTING DATES WEST OF THE MISSISSIPPI

Several attempts have been made to map planting zones for that section of our country lying west of the Mississippi. There is much doubt in the minds of many persons concerning the success that will result from these efforts. The difficulty in the way of successfully mapping this section lies in the fact that because of the mountainous character of the country the altitude varies greatly within the same state and sometimes wide variation occurs even within the same county.

The United States Weather Bureau and the United States Department of Agriculture have published the maps in this chapter, giving the average dates of the last killing frost in spring and the first killing frost in fall in the Rocky Mountains and further west.

I. EARLIEST VEGETABLE PLANTING DATES FOR THE WESTERN HALF OF THE UNITED STATES

The first map (Fig. 14) shows the average dates of the last killing frost in spring in the western part of the United States. The planting of the vegetables given in the following groups should be governed by the frost dates shown on the map.

Classification of Vegetable groups. For convenience in using the gardener's planting tables we repeat the classification of vegetables into groups given on page 66.

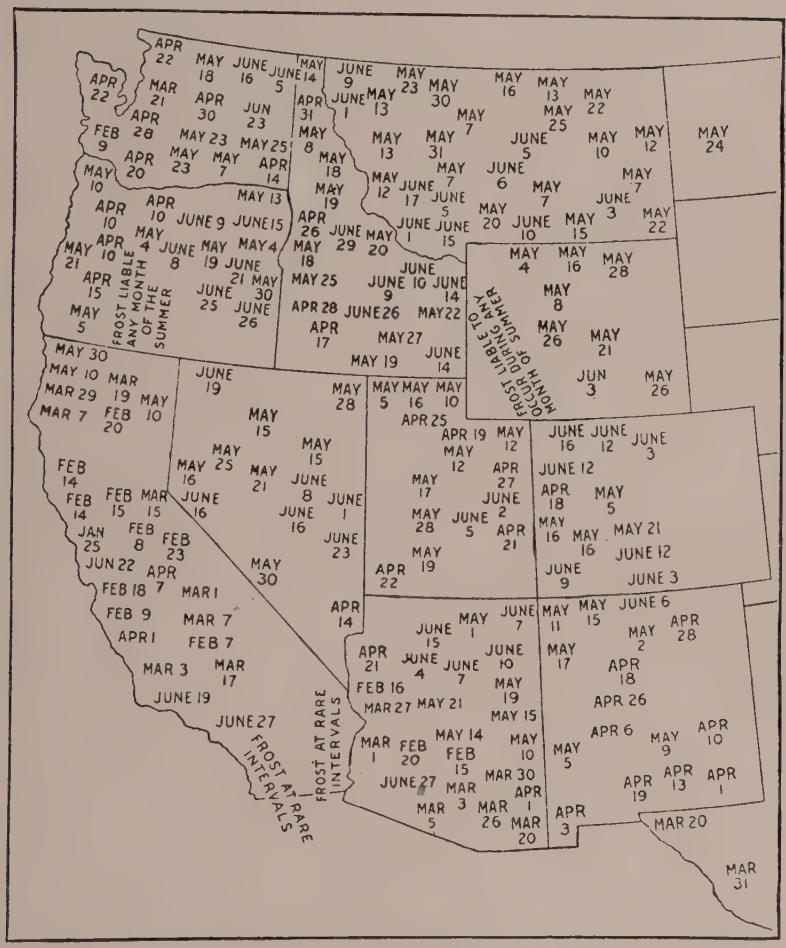

FROST LIABLE ANY MONTH OF THE SUMMER
FROST LIABLE TO OCCUR DURING ANY MONTH OF SUMMER
FROST AT RARE INTERVALS
FROST AT RARE INTERVALS

FIG. 14. *Map of the western part of the United States, showing the average dates of the last killing frost in the spring.*

Group 1. Vegetables that may be planted two weeks before the last killing frost:

Early cabbage[1]	Mustard	Early potatoes
Collards	Onion sets	Radishes
Kale	Early smooth peas	Turnips

Group 2. Vegetables that may be planted about the date of the last killing frost:

Beets	Celery seed	Onion seed	Wrinkled peas
Chinese cabbage	Sweet corn	Parsley	Salsify
Carrots	Lettuce	Parsnips	Spinach
Cauliflower plants			

Group 3. Vegetables that should be planted two weeks after the last killing frost:

Snap beans	Okra	Tomato plants

Group 4. Vegetables that cannot be planted until the soil is well warmed up, or about one month after the last hard frost:

Lima beans	Eggplant	Pepper plants	Squash
Cucumbers	Melons	Sweet potatoes	

II. LATEST VEGETABLE PLANTING DATES FOR THE WESTERN HALF OF THE UNITED STATES.

The map (Fig. 15) shows the average dates of the first killing frost in the fall in the western part of the United States.

There is also an accompanying table showing the time necessary for the maturing of vegetables in any locality. Knowing the average dates of the first killing frost in the fall and the time necessary for the vegetables to mature,

[1] Plants from hotbed or seed box.

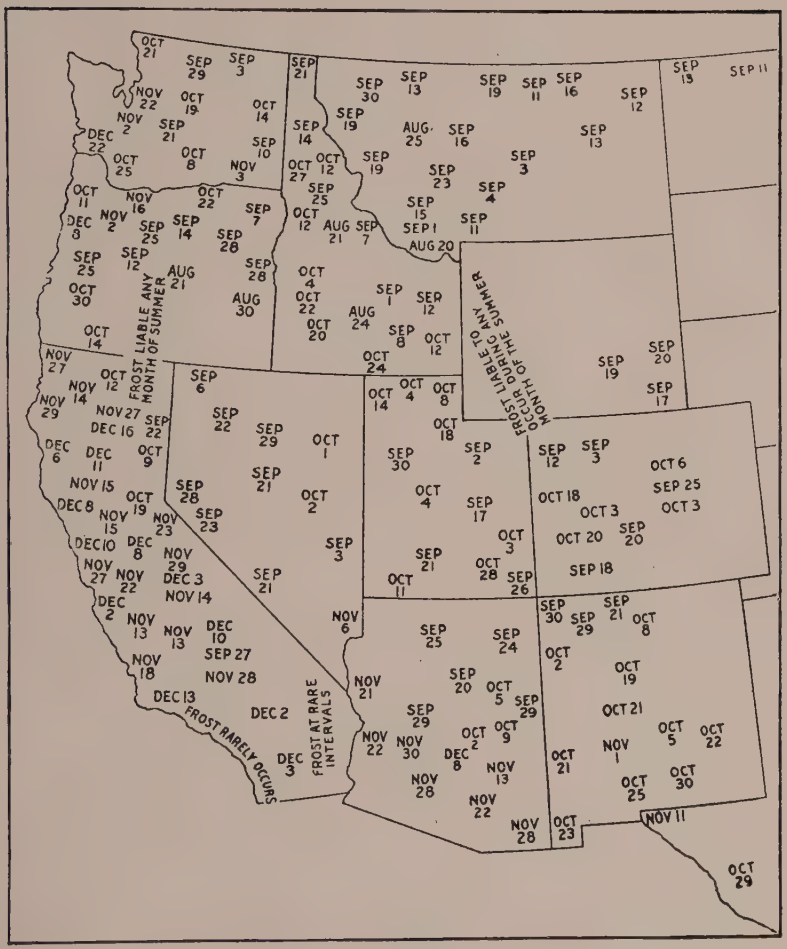

FROST LIABLE ANY MONTH OF SUMMER
FROST LIABLE TO OCCUR DURING ANY MONTH OF THE SUMMER
FROST RARELY OCCURS
FROST AT RARE INTERVALS

FIG. 15. *Map of the western part of the United States showing the average dates of the first killing frost in the fall.*

we can find the best time to plant any vegetable contained in the list. As has already been suggested (Chapter XV), always consult experienced persons in any locality before planting either in the spring or fall.

TIME NECESSARY FOR MATURING VEGETABLES IN ANY LOCALITY

Crops	Period necessary for maturity	Crops	Period necessary for maturity
Beans, bush	40 to 65 days	Parsley	90 to 120 days
Beans, pole lima	80 to 120 days	Peas	40 to 80 days
Beets	60 to 80 days	Potatoes, Irish	80 to 140 days
Cabbage, late	90 to 130 days	Potatoes, sweet	140 to 160 days
Carrots	70 to 100 days	Radishes	20 to 40 days
Cauliflower	100 to 130 days	Spinach	30 to 60 days
Celery	120 to 150 days	Squash, bush	60 to 80 days
Corn, sweet	60 to 100 days	Squash, vine	120 to 160 days
Cucumbers	60 to 80 days	Tomatoes	80 to 125 days
Kale	90 to 120 days	Turnips	60 to 80 days
Lettuce	60 to 90 days		

CHAPTER XVII

THINNING AND REPLANTING PLANTS

Thinning. We may use the very best possible methods for testing and planting and still not always succeed in getting a uniform stand. In our desire to get a sufficient number of plants we frequently plant the seed too thick. Then there are times when weather conditions are so favorable for germination and growth that even inferior seeds seem to produce fairly good plants.

These conditions often make it necessary to thin the plants in the rows. Thinning the plants gives the gardener an opportunity to eradicate or get rid of all weak and inferior plants.

Thinning will allow ample room for all plants to grow and will insure their natural development. It also insures large and uniform specimens. Plants like carrots, beets, radishes, turnips, salsify, and onions cannot grow and develop smooth roots if crowded. Other garden crops will also be improved by thinning.

For the proper distance that should be allowed between plants in the rows consult the Gardeners' Planting Tables in Chapter VIII.

Replanting. Sometimes it is desirable to replant vacant spaces in the garden. This is just the opposite of thinning. We should replant as soon as we discover that the seed sown has not sprouted or that the plants set out have died or been destroyed by insects. Replanting is made necessary by poor seed, unfavorable weather conditions, or improper

planting. It helps to utilize all garden space and to secure maximum crop yields.

In replanting, place the new plants as nearly as possible in the spot where the former seed or plants failed to grow. The plants may sometimes be obtained from crowded rows that must be thinned. Where seeds are used for replanting soak them a few hours in warm water, so that they will germinate more quickly.

STUDY OUTLINE

1. Give two causes contributing to make plants grow too thick.
2. What advantage has the gardener who has surplus plants in his rows?
3. Name some plants that are injured by crowding.
4. What conditions make it necessary to replant?
5. Why should we replant vacant garden space?
6. When should replanting be done?
7. Where should the new plants be placed?
8. Suggest an economical and easy way to obtain plants for replanting.
9. Why should we soak seeds that are to be used for replanting?

HOME AND COMMUNITY WORK

1. Visit two or three gardeners in your neighborhood and where plants came up too thick ask what they think are the reasons.
2. Find out, if possible, the principal source from which they obtained plants for replanting.

CHAPTER XVIII

GROWING AND TRANSPLANTING PLANTS

Window boxes. Garden plants may be grown in a limited way from seeds sown in shallow boxes set in a sunny window of a dwelling house. The soil used should be obtained in the fall and should be rich and mellow.

Plant the seed in rows in the box. Mark on the box at the end of each row the kind and variety of seed planted. When the plants have two or three leaves transplant them to other boxes, setting them 2 or 3 inches apart (Fig. 16). This will enable them to grow more rapidly and to develop a good root system before being again transplanted to the cold frame or garden.

Transplanting for succession crops. Some gardeners transplant from the first box to small individual pots or berry boxes. When this is done the plants may be taken later from these pots or boxes and transplanted without destroying their root system or retarding their growth. If this plan is carefully followed a garden may be planted with good sized plants at an early date. We may also plan our box planting so that later-crop plants may be ready for the garden as rapidly as the early crops have been harvested. For example, pepper and tomato plants should be ready to set out in the garden as soon as the earliest lettuce and radishes have been used. Care, however, should be exercised in planting out tender plants like the tomato and pepper, as they are liable to be killed by frost. It is wise

also to cover the newly set out plants at night with newspapers or paper caps until all danger of frost is past (Fig. 17).

How to transplant. Before plants are taken out of boxes or cold frames they should be thoroughly watered, so that soil will adhere to the roots. After they are taken from the frames or boxes they should be set out at once. But if this is impossible, they can be kept a few hours by covering them with a damp cloth, which prevents wilting.

FIG. 16. *Seedlings ready to be transplanted to other containers, where they will have more room to grow and develop a good root system before it is time to set the plants out in the garden.*

Watering the plants. If the soil is very dry at the time of transplanting, all plants should be *watered out.* This may be done by making the holes and filling them with water a few minutes before you are ready to begin transplanting. Fill the hole about one fourth full of fine soil before pouring the water into it. Place the plant roots in the damp soil at the bottom of the hole and press the soil firmly about the roots. Then cover all damp earth with

dry soil. This will help hold the moisture until the plant takes root. When transplanting plants to the garden some gardeners apply water to the roots after setting out the plant but before all the soil is filled in. Water should never be poured over the surface of the soil about newly transplanted plants. If the plants have too much foliage some of the leaves should be removed to prevent their

FIG. 17. *A frosty evening in early spring. Protecting newly transplanted tomato plants from frost by setting over them these little paper caps may save the gardener an entire crop.*

evaporating more moisture than the roots are able to take up. All transplanting should be done late in the afternoon or in the evening.

If the weather is cool and there is sufficient rainfall at the time of transplanting, the plants will soon be growing well in their new location. If the weather is hot and the

soil very dry, all transplanted plants should be thoroughly watered once a week, until they begin to show signs of growing.

STUDY OUTLINE

1. Suggest a simple method of growing garden plants in the home.
2. How are plants that are grown in small seed boxes in the house transplanted to other containers?
3. What is meant by watering out? Why are plants sometimes watered out? Describe the process.
4. How may plants for transplanting be kept from wilting before they are set out?
5. When is the best time of day to transplant plants?

HOME AND COMMUNITY WORK

1. What ways of growing plants in the house are most commonly used in your community?

CHAPTER XIX

TILLAGE AND THE USE OF TOOLS

Many boys and girls have been known to follow nearly every suggestion we have thus far made and then fail with their garden. This unfortunate outcome was the result of what is sometimes called "garden fever." Early in the spring the children would be very anxious to have an excellent garden, but later in the season when the sun became very hot they would abandon the entire project. To make a success the gardener must stick to his task regardless of how hot the sun shines or how busy he may be with other work. In other words, the garden must have proper care through frequent cultivation with suitable tools.

Tillage. Stirring or cultivating the land to make it suitable for growing plants is called *tillage*.

The soil should be cultivated or tilled shortly after each rain in order to break the crust and keep a covering of dust to conserve the moisture. Never work the soil when it is too wet. It should be dry enough to crumble in the hands before you try to use a garden plow or hand hoe.

Stir the soil regularly and thoroughly throughout the season. Gardeners occasionally neglect to do this during dry periods. Try to keep the earth very fine and loose on the surface. This fine, loose, dry soil is called a dust *mulch*. Even if a mulch is already present the garden will be benefited by regular cultivation.

While the vegetables are small cultivate close to the plants and as deep as the roots extend into the soil. As

they grow larger cultivation should become more shallow and farther away from the row. Cultivate at regular inter-

FIG. 18. *Common tools every gardener needs in his work.*

vals until the plants are large enough to interfere. In a small garden a hand hoe or weeder may be used if further stirring seems necessary.

If a hard crust forms over the surface soon after the seeds are planted it will retard their growth and keep them from coming up. Therefore cultivate the top of the soil lightly to break the crust and enable the sprout to push through the earth.

Advantages of tillage. The advantages to be derived from cultivation or tillage other than the formation of a dust mulch are:

1. Improved physical condition of soil.
2. Increased quantity and availability of plant food.
3. Warmer soil.
4. Better ventilation, more air reaching the plant roots.
5. More thorough blending of fertilizers with soil.
6. Destruction of insects and weeds injurious to garden plants.

Common garden tools. The tools most commonly used in the cultivation and care of the home and school garden

FIG. 19. *A Minnesota lad tilling his onion field with a tractor cultivator. This boy follows the most approved methods of gardening and uses the best tools. His crop shows it.*

are the hand weeder, hoe, rake, wheel hoe, spade, garden line, measuring line, trowel, and shovel (Fig. 18). Tractor

cultivators are sometimes used where gardeners have large areas of special crops under cultivation (Fig. 19).

Use of tools. The hand weeder is a rake-like tool used to stir the soil between rows and plants. The hand hoe is also used for cultivation between the rows as well as between

FIG. 20. *Cultivating a garden with a wheel hoe. Evidently the soil is dry and hard but the effort required to push the hoe does not discourage this determined young gardener.*

the plants. The hand rake is used for leveling the surface, raking off the clods and making the soil fine for planting small seeds.

The wheel hoe is mounted on wheels and is equipped with several different kinds of shovels which may be changed as conditions demand (Fig. 20). It is used to cultivate between the rows and also for making the garden ready to plant. It is considered one of the most valuable of our garden tools. The spade and the shovel are for digging up and leveling the

soil. The trowel is used for transplanting young plants, and the garden line is useful in keeping the rows straight and thus giving the garden a neat appearance.

STUDY OUTLINE

1. Define tillage.
2. Why should soil be cultivated soon after a rain?
3. What is a dust mulch? Of what use is it?
4. Give six advantages derived from cultivation.
5. Name the tools commonly used to cultivate the garden.
6. Tell the use of each.

HOME AND COMMUNITY WORK

1. Describe the methods used in the cultivation of garden crops in four gardens near your home.
2. How many of these gardens were covered with a dust mulch?
3. What tools were used by each gardener?

CHAPTER XX

WATERING THE GARDEN

One of the gardener's greatest problems is providing an ample supply of water in dry weather. This problem cannot be overlooked since the growth of crops depends upon the plants receiving enough water during the growing season. Plant food must be in solution, or dissolved, before it can be absorbed. It cannot be dissolved unless the soil receives water naturally or artificially. Giving additional water to the soil to aid the growth of plants is called *watering* or *irrigation.*

Artificial watering. There are many different methods for applying water artificially to the garden. Among the means employed some of the most practical are garden hose, tin cans, sub-irrigation, the trench system, and the overhead sprinkling system.

Garden hose. When garden hose is used for watering the garden, sprinkle the ground thoroughly at night.

Tin cans. Watering is sometimes done by means of cans placed in the plant hills. Dig a hole the size of the can in the hill before the seed is planted or the plant set out. Perforate the sides and bottom of the can with nails so that the water will seep out and reach the soil. Place the can in the hole. Plant the seed or plant by the side of the can, and whenever the ground becomes dry pour water into the can.

Sub-irrigation. Probably sub-irrigation is the best method of applying water. The system is rather expensive to install but it is permanent. In this system the water reaches the

roots from below the surface and prevents the soil from baking. Trenches 18 to 24 inches deep and 3 feet apart are dug across the garden. In these trenches drain tiles, or four laths so nailed as to form rectangular tubes, are placed end to end. At certain places these tiles or lath tubes are brought to the surface and water is poured into them by means of a garden hose. The water reaches the soil by escaping between the ends of the tiles or by leaking through

FIG. 21. *Watering sweet corn with garden hose and trench system. Notice the distance of the trench from the corn rows. Where plants have less wide-spreading roots the trench may be closer to the rows.*

the lath tubes. After reaching the soil it climbs toward the surface and is then taken up by the roots of the plants.

Trench system of irrigation. In the trench system of irrigation the trenches should be dug close enough to the

rows so that the water will serve the plants, yet not close enough to disturb the roots (Fig. 21). Water may be run

FIG. 22. *A garden in Dayton, Ohio, that is watered by the overhead sprinkling system. Notice the flourishing appearance of the crop.*

into the trenches with a hose as often as it is needed. This is the best system for amateurs to use, since the water is below the roots and insures a deep root system. The trenches should be covered after watering.

Overhead sprinkling. The overhead method of sprinkling involves installing a system of galvanized pipes extending lengthwise over the area to be watered. These pipes may be used in 16-foot lengths, fastened together and mounted upon posts. A series of small holes are drilled in the pipes every 3 or 4 feet, and small nozzles inserted in the holes.

The pipes are connected with the water supply. When the water is turned into the pipes fine sprays issue from each nozzle. Different sections of the garden may be watered by shifting the pipes. One 16-foot length of pipe will water a strip of ground 16 feet long and about 40 or 50 feet wide. This system of sprinkling distributes the water gently, evenly, and thoroughly over the entire garden (Fig. 22).

Quantity of water applied. No matter what system is used, a thorough application of water once a week is better than a light application each evening. Cultivation should follow as soon as possible after the water has been applied. This will produce a dust mulch which will retain the moisture in the soil.

STUDY OUTLINE

1. Upon what does the proper growth of plants largely depend, and why?
2. What is watering?
3. Name five methods by which the garden may be watered and describe each.
4. Why should cultivation follow the use of water?

HOME AND COMMUNITY WORK

1. What system of watering do you use at your own home?
2. What systems are used in your neighborhood?
3. Which seems to be the most satisfactory?

CHAPTER XXI

PROTECTING THE GARDEN PRODUCTS

Many garden plants are destroyed by rabbits, sparrows, dogs, cats, moles, and chickens. The young gardener, therefore, should be prepared to protect his crops from these intruders.

Cheesecloth frames. One of the best means of protecting young plants from these enemies, as well as from insect pests, is the cheesecloth frame. These frames may be made in small squares to cover the individual hills or, if preferred, in lengths that will cover several hills. Hill frames are made 2 or 3 feet square. To make the frame use 4 thin pine boards, 6 inches wide, nail them together at the ends, and tack cheesecloth over them. When cheesecloth frames are to cover an entire row they may be made in sections 10 to 12 feet long and 4 feet wide.

Light brush. Some protection may be furnished plants by placing light brush over them. The brush must not be too thick or it will exclude the light.

Bright or shining objects. Strips of tin, or tin cans suspended from poles, placed in the garden will sometimes keep birds from injuring garden crops. This is because of the bright sun shining upon the tin. Three or four cans or strips of tin should be tied together so that the noise resulting from their striking against each other as they sway in the wind will also tend to frighten the birds away.

Mole traps. Mole traps set in mole runs are useful in catching and destroying these animals (Fig. 23).

FIG. 23. *The result of using a mole trap. This troublesome little animal will never damage a garden again.*

Wire fencing. If the garden is enclosed with a wire fence 5 or 6 feet high, dogs, chickens and cats will probably not damage the crops. Wire fencing with a fine mesh is best suited for this purpose.

STUDY OUTLINE

1. Tell about cheesecloth frames and how they are used to protect the garden.
2. In what way may brush be used to protect the garden from birds?
3. What good should result from the use of shining objects in the garden?
4. How are moles caught?
5. Should a garden be surrounded by a fence? If so, why?

HOME AND COMMUNITY WORK

1. What plans are used at your home to afford protection to the garden crops?
2. Are any other means used in your community to protect garden crops beside the ones just mentioned? If so, describe them.

CHAPTER XXII

GARDEN RECORDS

The gardener should keep careful records of all garden operations. A record of everything done in the garden should be made just as soon as the day's work is over (Fig. 24).

In order to judge of the profits obtained from the garden a careful account should be kept of the following items:

EXPENSES

1. A charge of 10 cents per hour for each child's labor.
2. A charge of 25 cents per hour for adult labor.
3. A charge of 30 cents per hour for horse labor. If it is necessary to hire a horse charge actual cost.
4. Tractor labor, where used, at actual cost.
5. Any charge for the labor of a man to aid in plowing.
6. Fertilizers and stable manure at actual cost. If stable manure is taken from home barns charge $1.00 for one-horse loads and $2.00 for two-horse loads.
7. Seeds and plants at actual cost, or their real value in the market if produced at home.
8. Tools, cans, and other equipment on hand should be charged at one-third their market value.
9. Any other item of expense you may have incurred.

RECEIPTS

1. Cash received from sale of products.
2. Cash received from sale of canned goods.
3. Value of products used in the home.
4. Value of canned products to be used in the home.
5. Any other cash or value received from the garden.

Keep a copy of the garden plan you used. Indicate on it the length of rows (or size of beds), the names of fruits or vegetables planted, the date when each variety and type was planted, cultivated, thinned, and harvested (Fig. 25).

Careful record should be kept of the amount of fruit or vegetables canned, pickled, preserved, stored, and the date when each was so conserved.

The gardener should also keep a record of all the best varieties as well as all the best combinations for companion and succession cropping systems. The keeping qualities of

FIG. 24. *Records and market prices. With an eye to business these young gardeners consult the market reports before entering the day's record in their garden book.*

fruits and vegetables, the results gained from the use of different grades of fertilizers, crop rotation systems, and the

FIG. 25. *A practical lesson on how to keep a garden record. This is an important part of the work of gardening.*

kinds of spraying materials found to be most satisfactory, should become a part of the garden records.

STUDY OUTLINE

1. What records should be kept in connection with the receipts received from the sale and use of garden products?
2. Name the expense items that should be accounted for in any garden record.
3. What other records should be included in a daily record book by an efficient keeper of garden records?

HOME AND COMMUNITY WORK

1. Did you keep a record of your garden work during the past year? If so, what items did you set down in your book?
2. Inquire of five persons in your neighborhood and learn how many keep records of all their garden operations.

CHAPTER XXIII

SPRAYING FOR INSECTS AND PLANT DISEASES

I. INSECTS

The history of most insects may be divided into four periods: First, the *egg* which hatches into a worm-like animal called the *larva*. Most larvae are green. During the larva or second stage of development the insect grows rapidly and therefore requires a great quantity of food. It is during this stage that the insect does the most damage to garden crops and that we can most successfully undertake to destroy it. When the larva attains its full development it seeks some secluded place and spins a cocoon about itself. Within this cocoon or enclosure the insect passes its third or *pupal* stage of development. During this stage a complete change takes place. The larva enters the stage as a worm-like animal, but emerges into the fourth stage as a fully developed *insect*.

True insects. A true insect is a small creature which in the adult stage has rather a hard body. The body is divided into three parts—the head, thorax or chest, and abdomen. True insects have a single pair of feelers or antennae, three pairs of legs, and usually one or two pairs of wings.

True insects that are injurious. Some true insects that are injurious to garden crops are beetles, butterflies, moths, sawflies, grasshoppers, plantbugs, thrips, and plant lice.

Other injurious insects. There are other tiny animals popularly known as insects that injure garden crops. Some of these are sowbugs, red spiders, and mites.

Chewing and sucking insects. Insects are classified as chewing, or biting, and sucking. Chewing insects eat the leaves and other parts of the plant. Sucking insects injure plants by sucking away their juices.

Sprays for chewing insects. Since chewing insects bite, chew, and swallow the leaves and stems of plants, they may be killed by placing poison upon the plants which they attack. The insects take the poison into their stomachs

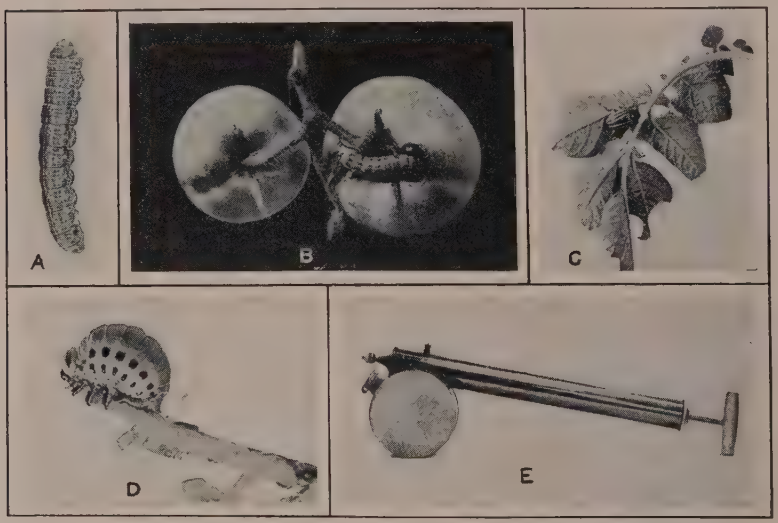


FIG. 26. *Enemy insects. A, tomato worm; B, tomato worm at work; C and D, potato beetles; E, a sprayer to destroy these enemies.*

with the portion of the plant eaten. Arsenicals, including Paris green and arsenate of lead, are recommended to kill chewing insects. Cabbage and tomato worms and potato beetles are common examples of chewing insects (Fig. 26).

Treatment for sucking insects. The sucking insect procures its food by inserting its beak into the tissues of the

stems or leaves of plants and sucking out the juices, the loss of which causes the plant to die. Since the source of the food supply of these insects lies beyond the reach of poisonous sprays they cannot be destroyed by poisons placed upon the plants. Therefore to kill this class of insects it is necessary to use some strong spray that will kill them when it comes in contact with their bodies. Soaps, pyrethrum, and kerosene emulsion are some of the sprays used for this purpose. The squash bug and the aphis are examples of sucking insects.

When to spray plants. To check both chewing and sucking insects, plants should be sprayed as soon as any

FIG. 27. *Armed for battle. These pupils are all ready for a practical lesson in spraying for insect and plant diseases.*

injury is noticed or as soon as insects are seen. Repeat the treatments until the insects disappear.

Liquid and dry sprays. Liquid sprays may be applied to garden crops by using an ordinary sprinkling can, but a force pump or a good hand is better. A hand atomizer will answer very well as a sprayer for the small garden (Figs. 27 and 28).

Poisons in powder form are distributed upon plants by means of a dust bag or can, or by an automatic dusting machine. An easy way to spray with dry Paris green, or other poisons in powder form, is to puncture an old can with a small nail, and tie it to a stick or pole. Then fill the can with the poison, and by striking the pole lightly the Paris green will be jarred out upon the plants. Dry poisons are most successfully applied when the leaves are wet with dew. Always see that plants are thoroughly covered with the poison whether in liquid or dry form.

II. PLANT DISEASES

Fungi and bacteria. Plant diseases which cause the greatest injury to garden crops are due to fungi and bacteria. Fungi and bacteria are plants that live on or in our vegetables and fruits and feed upon the crop plants, causing blights, rots, scabs, and spots. They multiply by means of spores instead of seeds. These spores are spread by wind, water, or insects. The spores germinate and grow, starting a new center of the disease.

Preventing plant diseases. Some of the ways to guard against plant diseases caused by fungi and bacteria are by rotating garden crops, by keeping all weeds out of the garden, by destroying fruits and vegetables as soon as they decay and by being careful to avoid injuring the plants through breaking the leaves or stems.

Spraying with Bordeaux mixture. The chief remedy for the control of fungous diseases of vegetables and fruits is to spray them with a compound of blue vitriol, lime, and water called Bordeaux mixture. These ingredients can be purchased at the store and prepared at home. Bordeaux mixture may be applied with the hand atomizer sprayer. Use the sprayer before a rain rather than after, as this gives the spray time to dry on the leaves. More applications are needed in wet weather than in dry. During wet weather, especially when heavy dews and fogs are common, spray every three or four days. In dry weather spraying every eight or ten days will keep the plants protected. For directions for the preparation and use of Bordeaux mixture consult Chapter XXXVII.

FIG. 28. *Spraying plants to prevent diseases. Gardeners learn early that "an ounce of prevention is worth a pound of cure."*

Sprays for each crop. In later chapters the gardener will find spraying suggestions for the treatment of insects and plant diseases in connection with each crop discussed.

STUDY OUTLINE

1. Describe the four stages through which the insect passes in completing its life history.
2. What is a true insect? Name some which injure garden crops.
3. What other small animals commonly spoken of as insects injure garden crops?
4. Into what two forms are insects classified?
5. How may we poison chewing insects?
6. Name three examples of this class of insects.
7. How are sucking insects destroyed?
8. Name two insects of this class.
9. How are liquid sprays applied to plants? How are dry sprays applied?
10. What causes plant diseases?
11. How do fungi and bacteria multiply?
12. How may plant diseases be prevented?
13. What remedy is used to control fungous diseases?

HOME AND COMMUNITY WORK

1. What insects are most numerous in the gardens of your community?
2. Classify the most common ones under chewing and sucking kinds.
3. What materials have been used to destroy these insects?
4. What means other than spraying have been used to rid the gardens of insects?
5. How do the gardeners distribute the poisons over the plants?
6. What plant diseases are most troublesome in your neighborhood?
7. What means are taken to control them?

CHAPTER XXIV

PROTECTING GARDEN CROPS FROM FROST

The growing season for garden crops may be lengthened by providing protection against frost in early spring and late fall. It often happens that frost occurs on one night only, after which the weather continues warm for a long period. To save the plants during this one night means increased garden production.

During the periods when frost is likely to occur, the gardener should give attention to the weather forecasts and frost warnings sent out by the United States Weather Bureau.

How plants may be protected from frost. There are many devices or plans for protecting garden crops against frost. These include cheesecloth frames, muslin, newspapers, tin cans, boxes, barrels, fruit cartons, and patented devices used to cover the plants. Hay and straw, if available, may also be used for this purpose.

Where plants are small the cheesecloth frames made to protect them from injurious insects will also protect them from frost. Where newspapers, muslin, or sacks are used put them over the hills in such a way that their weight will not break down the plants. It will be necessary to place clods or stones on the corners of the covers to keep them from blowing away. Where cans, boxes, and pasteboard cartons are used they may merely be placed over the top. Hay or straw thrown loosely over the plants also affords

protection against frost. Sometimes a barrel is placed over a large plant to protect it.

These protecting devices are all inexpensive and very easy to adjust over the plants. Gardeners should always keep on hand a supply of material for constructing them.

If a slight frost occurs at a time when the plants are unprotected, to revive them try sprinkling with water early the next morning before the sun rises.

STUDY OUTLINE

1. Name five devices that may be used for protecting plants from frost.
2. How does the use of frost-protecting devices lengthen the growing season?
3. Did you ever try sprinkling a frosted plant with cold water? If so, what was the result?

HOME AND COMMUNITY WORK

1. What frost-protecting devices are used in your community?
2. Do the people of your community consult the United States Weather Bureau reports?

CHAPTER XXV

WEEDS AND WEEDING

Useless plants, or plants growing out of their proper place are called *weeds*. Weeds are usually vigorous and persistent. They compete with food plants in taking from the soil light, plant food, and moisture which the others need. They also afford protection to injurious insects. Weeds are always in evidence and must be destroyed if the garden is to produce the best results. Removing weeds to promote the growth of useful plants is called *weeding*.

How weeds are classified. Weeds, like useful plants, are classified as annuals, biennials, and perennials.

Annuals. The annuals come up from seed, blossom, ripen their seeds, and then die, all in one season. They can be destroyed by any method that will prevent their going to seed. A simple plan is to cut them off. A better plan is to pull them, root and all, and carry them out of the garden. Some examples of annuals are the ragweed, wild mustard, pigweed, and purslane.

Biennials. The biennial weeds live two years. The first year they come up from seed, grow, and store up food in their roots. They do not produce seed the first year, and all of the plant except the root dies. The second year the plant, using the food stored in the roots, grows, produces seed, and dies, root and all. The best way to destroy this class of weeds is to pull them the first year, both plant and root. If we begin cutting biennials we must keep at it until the food stored in the roots is exhausted by the plant's efforts

to produce seeds. The burdock, wild parsnip, bull thistle, and the mullein are common examples of biennial weeds.

Perennials. Weeds classed as perennials grow from seeds and also multiply from some form of root or underground stem. Plants of this class live on year after year. Continual cutting or pulling up by the roots will destroy them. Fall spading or plowing aids in exposing the roots to frost which may kill them. Perennials may be smothered out by sowing grasses which cover the ground with a thick growth. If perennial weeds continue to grow after cutting the tops a few inches below the surface of the soil, apply strong salt water to the roots. This will kill them. The Canada thistle, yellow dock, ox-eye daisy, and sorrel are some common examples of perennials.

STUDY OUTLINE

1. What is a weed?
2. Why should weeds be destroyed?
3. What is weeding?
4. Into what classes are weeds divided?
5. What are annual weeds? How are they destroyed? Name two kinds.
6. What are biennial weeds? How are they destroyed? Name two kinds.
7. What are perennial weeds? How are they destroyed? Name two kinds.

HOME AND COMMUNITY WORK

1. Name two weeds of each class that grow in your neighborhood.
2. What methods are used to destroy weeds of each class in the gardens of your neighborhood?
3. What weeds of each class are most numerous in your community?

CHAPTER XXVI

THE GARDENER'S FRIENDS

Although the gardener may not know it, he always has some faithful friends around him, in and near his garden. They may be called friends because they aid in protecting his garden from injury by the insects that threaten it.

Insect friends. Among the gardener's friends are the insects which destroy other insects that are injurious to his plants. These include ladybirds or ladybugs, wasps, ichneumon and chalcid flies, ground beetles, syrphus flies, tachina flies, and lace-wing flies.

The ladybird or ladybug destroys all forms of garden plant-lice as well as the eggs of several insects including the Colorado potato beetle.

Wasps kill or paralyze injurious insects by stinging them. They then feed the insects to the young wasps.

The adult ichneumon flies feed chiefly on the juices of plants. They lay their eggs on, near, or beneath the skin of the larva, or insect form, on which the young are to prey (Fig. 29). When the eggs hatch, the young ichneumon flies feed on the tissues and juices of the host, that is, on the insect in which the eggs were deposited, and this later causes the death of the insect. As these are mostly injurious insects, the ichneumon fly is a true friend and ally of the gardener.

The chalcid flies destroy injurious insects in the same way, while the tachina flies in like manner deposit their eggs in caterpillars that are injurious to plants.

The larvae of lace-wing and syrphus flies destroy the aphis, a kind of plant-louse, by feeding upon its tissues and juices in a way similar to that practiced by ichneumon flies.

Ground beetles are other friendly insects that feed upon injurious ones.

Toads. The toad, which is a great feeder, begins hunting for food soon after sundown. Toads eat so many insects that gardeners sometimes employ boys to collect them for

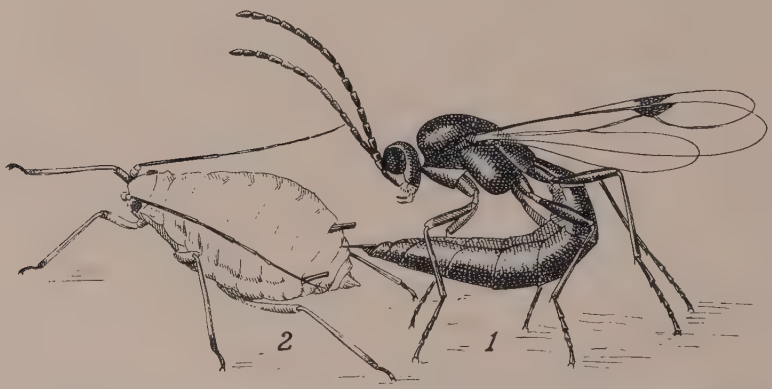


FIG. 29. *Two insects, a friend* (1), *and an enemy* (2). *The young hatched from the eggs insect one is depositing beneath the outer covering of insect two will in time cause the death of the enemy insect.*

the protection of their gardens. Toads will destroy cutworms, army worms, caterpillars, crickets, grasshoppers, and other insects. They hide under boards, stones, and brush when they are not feeding. To induce these friends to visit the garden or to make it their home a few such objects should be left in or near it to afford them protection.

Birds. Almost all birds are friends of the gardener, although some prove to be better friends than others because

they do a greater service. The insect eaters are most valuable because they destroy a large number of the plants' most injurious enemies. Birds that live on seeds help the gardener indirectly by eating seeds that would otherwise live to produce weeds.

Insect-eating birds should be encouraged to build their nests near the garden. The gardener may encourage them to do so by building bird houses, by placing vessels of water in the garden, and by throwing out a few bread crumbs or other bits of food to afford the birds a variety of diet (Figs. 30 and 31). Shrubbery, bearing edible berries, as well as mulberry, wild cherry, or other fruit trees planted near the garden, also helps to attract birds to it.

FIG. 30. *A bird bath and a feed shelf. The owner of this garden is very sure to have many friendly visitors.*

Sparrows may cause some trouble, as has already been mentioned (Chapter XXI), since they are fond of eating the tender leaves of early plants, such as lettuce and peas.

We can protect these plants for a few days until they get well started, and then remove the brush so that other birds can catch the insects that injure peas or lettuce.

FIG. 31. *A feeding shelf for birds. Notice also the suet and the strings of peanuts provided for them by the gardener.*

Other garden friends. Lizards, non-venomous snakes, and skunks, all serve the gardener because they destroy many insects. The earthworm does its part by making the soil more porous and this makes possible better and larger crops.

The gardener should welcome these friends and endeavor to become acquainted with them so that he may be able to distinguish them from his garden enemies. He will very soon come to appreciate the value of the work they do for him. Then he will offer them every encouragement and inducement to visit his garden frequently or to make their homes year after year among his trees.

STUDY OUTLINE

1. Name five insects that destroy injurious insects.
2. How does the wasp kill insects?
3. How does the ichneumon fly destroy the injurious insects?
4. What other flies have the same habits?
5. Upon what insects do toads feed?
6. How may we encourage birds to visit our garden?
7. What other friends has the gardener?

HOME AND COMMUNITY WORK

Visit three gardens in the neighborhood just about sundown.

1. Did you see any toads in the gardens? If so, how many?
2. What friends besides toads have been observed in the gardens of your neighborhood?

CHAPTER XXVII

LETTUCE

Soil and climate. Lettuce is usually one of the earliest plants sown in the garden. It thrives best in cool weather, and for this reason we should plant the seeds in the early spring or late fall. It grows best in a rich, sandy soil that contains considerable humus. Lettuce grown during the summer months when the sun is hot is of little value except for garnishing. Summer grown lettuce for the table should be planted in a location that is partially shaded.

FIG. 32. *A field of fine lettuce. Only a congenial soil, careful cultivation, and a sufficient water supply will produce a crop like this.*

Planting and cultivation. Lettuce seed may be sown broadcast in a bed and the leaves removed from the plants

FIG. 33. *A fine specimen of head lettuce. Lettuce is grown everywhere in the United States and is our most popular salad plant.*

as rapidly as they become large enough to use. A better way is to transplant the seedlings in rows and thin them as needed when the plants are large enough for the table. If the heading kind is sown, the plants should be thinned to 10 inches apart in a row and permitted to grow until compact heads are formed (Figs. 32 and 33). The entire plant may then be cut for use. The soil in the lettuce bed should be well pulverized. Sow the seed and rake in with a garden rake. Cover seed with about half an inch of soil.

Lettuce plants require frequent shallow cultivation. The bed should be kept free from weeds. The leaves (or head) are crisper if the crop is forced and successive plantings are made ten days or two weeks apart throughout the early spring and late fall.

For a very early crop, lettuce should be started in a hotbed or indoor box and the plants transplanted to the garden as soon as there is no further danger of a hard freeze. Lettuce may be grown between the rows of long-season crops.

Varieties. The varieties of both leaf and head lettuce that will prove most dependable are:

LEAF	HEAD
Grand Rapids	Big Boston
Blackseeded Simpson	May King

STUDY OUTLINE

1. What soil and climatic conditions are most favorable for growing lettuce?
2. Tell how lettuce should be planted and cultivated.
3. How are crisp leaves produced?
4. How may a very early crop be obtained?
5. Name two varieties of leaf lettuce.
6. Name two varieties of head lettuce.

HOME AND COMMUNITY WORK

1. What are the most common methods of growing lettuce in your community?
2. What varieties are grown?
3. Which of these have proved most successful?
4. Are the head or leaf varieties more generally grown?

CHAPTER XXVIII

RADISHES

Soil and climate. Radishes do best in a rich soil. If the seed is sown in poor soil their growth will be slow and their quality not first class. Radishes are better when grown in cool weather rather than in hot, therefore the seed should be planted in early spring or late fall. The seed may be sown in the open ground as soon as the soil is moderately warm.

Planting and cultivation. Radish seed should be covered about ½ inch deep with very fine soil. Plant the seed 1 inch apart in the rows, using 1 ounce of seed for every 100 feet of row space. For a constant supply, plant seed about every two weeks during the spring and fall months. Begin using the radishes as early as possible, for they lose their crispness (Fig. 34) and delicate flavor if allowed to remain too long in the open ground. Thinning the plants

FIG. 34. *A prize bunch of scarlet globe radishes. Even in a picture the freshness and crispness of these radishes is apparent.*

permits those that remain more space for growth. Radishes may be sown between the rows of long-season garden crops.

Cultivate radishes frequently in order that the soil may be kept loose about the roots. Keep the rows free from weeds.

Varieties. One or two excellent varieties of each kind of radishes are as follows:

EARLY	SUMMER	WINTER
Scarlet Globe	White Icicle	Japanese
Short Top		

STUDY OUTLINE

1. What soil and climatic conditions are most favorable for growing radishes?
2. Why should we use radishes while they are young?
3. What are the advantages of thinning the roots in the row?
4. Suggest a plan for companion cropping including radishes.
5. Name one variety each of early, summer, and winter radishes.

HOME AND COMMUNITY WORK

1. What methods of culture are used in your community for growing radishes?
2. What companion cropping plan including radishes is practiced in your neighborhood?
3. What varieties are most commonly raised there?

CHAPTER XXIX

PEAS

Soil and climate. Peas require rich, mellow soil made firm by thorough working. The first crop should be planted as early as the soil can be worked. Peas are not injured by light frosts.

Planting and cultivation. Peas should be covered about 2 inches deep with fine soil, and should be planted every two weeks until hot weather, in order to insure a continuous supply. Plant about 15 seeds to the foot, using 1 to 2 pints for 100 feet of row space. Some gardeners plant in double rows 6 to 8 inches apart and 3 to 4 feet between the double rows. This plan is especially advisable when varieties requiring support are used. The support is placed between the rows of the double row. Brush, wire netting, and stakes are used to support large growing varieties. The wire netting should be tacked firmly to stakes located about every 8 feet in the row. When strings are used, the stakes should be placed about 4 inches apart. Drive stakes supporting either netting or strings about 10 inches into the soil, so as to produce a firm support for the pea vines.

Cultivate frequently. As the vines grow larger draw the dirt up around them to give support.

Insect enemies. The most harmful enemies of the pea are the plant-louse known as the pea aphis, and the pea weevil, a tiny beetle-like insect. Attacks of the aphis may be prevented by applying kerosene emulsion to both sides of the leaves. This emulsion is made as follows: Shave

¼ pound of hard soap into fine pieces. Dissolve this fine soap in ½ gallon of boiling soft water. Remove from the fire and pour 1 gallon of kerosene into the soap and water mixture. Churn or shake well while the mixture is still hot, and continue until a creamy emulsion is formed. For use in warm weather add 1 part to 9 parts of soft water. For cold weather use in the ratio of 1 to 7. Sprinkling the young plants with water in which tobacco leaves have been soaked sometimes prevents injury to pea vines. The pea weevil injures the seed while in storage. To destroy it use 1 to 2 ounces of bisulphide of carbon to 100 pounds of seed.

Varieties. The first plantings should consist of the dwarf, quick maturing varieties. Follow with the wrinkled kinds. For the fall garden use early dwarf varieties. Some varieties of both kinds are:

EARLY DWARF	WRINKLED
Alaska	Champion of England
Gradus	Telephone

STUDY OUTLINE

1. What soil is most suitable for peas?
2. Suggest common methods for supporting climbing pea vines.
3. What two insect enemies do most damage to the pea?
4. How is kerosene emulsion prepared?
5. How may the pea weevil be destroyed?
6. Name two varieties each of the early, medium, and late peas.

HOME AND COMMUNITY WORK

1. In what kind of soil have peas been planted in your home garden?
2. What methods are used in your neighborhood for supporting climbing pea vines?
3. What varieties of peas are usually planted in your community?
4. What varieties are most successful?

CHAPTER XXX

ONIONS

Soil and climate. Onions do best in well-drained loams that contain a large amount of humus. They may be grown in all temperate climates and are a very widely cultivated crop (Fig 35).

Planting and cultivation. For a crop of dry onions use 1 ounce of seed for 100 feet of row space, planting seed 1½ inches apart in a row and covering with 1 inch of fine soil. When early bulbs are desired, plant the seed in a hotbed or an indoor seed box. Transplant the plants to the soil as early as it can be worked. Plants 4 or 5 inches high are the best size for transplanting. When sets are planted use 1 quart to 100 feet of row space, placing the sets about 2 inches apart in a row and from 1 to 2 inches deep.

Early spring onions may be produced by planting multipliers in the fall. If only the new growth is desired for food, plant old onions that have already started to grow. Onions require shallow cultivation and hand weeding. They may be pulled any time after they become large enough to eat. These are known as green onions. When onions get ripe the outer skin of the bulbs becomes dry and the tops fall.

Onion diseases. Onion smut and downy mildew are serious diseases of the onion. Smut attacks the entire plant and prevents its proper growth. This disease may

be prevented by treating the seed with formalin solution at the rate of 1 ounce of formalin to 1 gallon of water.

FIG. 35. *Spring onions. The onion was one of the very first vegetables to be cultivated. Today it is seen in every early garden.*

Soak seed 20 minutes in this solution. The mildew may be prevented by spraying with Bordeaux mixture (Chapter XXXVII).

Insect enemies. Onion maggots frequently do considerable damage in some soils. If they are discovered, discontinue growing onions in the infested area for a period of two or three years. Try a rotation of crops and plant other vegetables in that space. By this plan the maggots will probably disappear.

Varieties. A few good varieties to plant both as onion sets for green onions, and for dry onions to store for winter use are:

SETS	DRY
White Silverskin	Yellow Globe
	Silver King

STUDY OUTLINE

1. Upon what soils do onions grow best?
2. What planting methods should be used?
3. How may early spring onions be produced?
4. How may early sprouts be produced?
5. When are green onions ready to use?
6. What conditions indicate that onions are ripe?
7. Name two diseases of the onion.
8. How are these controlled?
9. How are onion maggots controlled?
10. Name a variety used for sets, and one used for dry onions.

HOME AND COMMUNITY WORK

1. In what kind of soil are onions grown?
2. What plan is used to get early sprouts or early onions?
3. Has there been any evidence of mildew or smut in your community and if so, what means were used to control it?
4. What varieties are commonly grown by your neighbors?

CHAPTER XXXI

CABBAGE

Soil and climate. To produce early cabbages a rich, warm, mellow soil is required. The seeds of early varieties may be sown in a hotbed or an indoor seed box. The plants are hardy and will stand a light frost. Cabbages can be left in the garden until cool weather without injury to the heads.

Planting and cultivation. Cabbage plants should be transplanted as soon as the soil can be put in good condition. They should be placed about 12 to 18 inches apart in the row and ½ to 1 inch deep. The rows should be from 30 to 36 inches apart for convenient cultivation with the wheel hoe. Seed for the fall crop should be planted in June. Transplant the plants as soon as they are about 4 inches high, and when the soil contains sufficient moisture to insure their proper growth. Plant late cabbage between the rows of early potatoes about three weeks before the potatoes are dug.

Diseases of the plant. Cabbages and turnips are subject to a disease called clubroot. It is due to a fungus which develops swellings on the roots. The remedy is rotation of garden crops and an application of lime to the soil. Black-leg, yellows, black-rot, and soft-rot in cabbage may be prevented by sowing clean seed in a soil free from disease, by practicing crop rotation, and by destroying all old stalks in the fall of the year.

Varieties. Some favorite varieties of both the early and late kinds are:

EARLY	LATE
Jersey Wakefield,	Flat Dutch,
Copenhagen.	Danish Ball Head.

Chinese cabbage. This plant is often called "celery cabbage" and may be served either as a potherb or a salad. It is most frequently cooked for greens during the spring months because of the difficulty of getting it to head at that time. The growth and cultivation of Chinese cabbage are the same as for common cabbage. It needs a rich, well-drained soil as well as plenty of moisture. This plant matures in much less time than ordinary cabbage and so may be planted for a late crop about the same time as fall turnips.

STUDY OUTLINE

1. What soil is most favorable for the growth of cabbage?
2. What plan for companion cropping is suggested for late cabbage?
3. What plant diseases are common to cabbage?
4. How are these prevented?
5. Name one early and one late variety of cabbage.
6. What is Chinese cabbage?

HOME AND COMMUNITY WORK

1. What soils seem best adapted to the growth of cabbage in your community?
2. What companion cropping plans including cabbage are practiced in your locality?
3. What diseases of cabbages are most common in your neighborhood?
4. What methods are taken to control them?
5. What varieties of cabbage do you learn are most common?

CHAPTER XXXII

CABBAGE ENEMIES AND THEIR CONTROL

The cutworm, cabbage worm, cabbage looper, flea-beetle, and plant-louse are the chief enemies of cabbage.

Cutworms. The stems of many plants in the spring garden are cut off by cutworms. These destroyers may be poisoned with bait placed near the plants. To prepare this bait mix 1 teaspoonful of Paris green with 1 quart of bran and moisten with sweetened water. Garden plants may be protected from cutworms by wrapping paper around the stems when ready to set out. The paper should extend about 1 inch below and 2 inches above the surface of the soil. This simple plan has saved many a

COURTESY OF PURDUE UNIVERSITY.

FIG. 36. *A sure way of protecting tomato plants from cutworms.*

garden plant. Fig. 36 shows (1) the paper in place and (2) the plant after transplanting.

Cabbage butterfly. The cabbage butterfly deposits her eggs upon the under side of the cabbage leaves. The eggs

FIG. 37. *An interesting lesson in a home garden. These young gardeners are studying a stage in the life history of the cabbage butterfly that they may learn to fight the enemy successfully.*

soon hatch into pale green worms which feed upon the leaves (Figs. 37 and 38). To prevent this, spray the plant with fine air-slaked lime, road dust, wood ashes or powdered tobacco.

Treatment for other pests. To destroy the cabbage worm, cabbage looper, and flea-beetle, mix Paris green with lime or ashes at the rate of 1 tablespoonful of Paris green

to 1 pint of lime or ashes. This should be dusted on the plants early in the morning when the dew is still upon the leaves.

Most gardeners prefer arsenate of lead to Paris green. When this is used in powder form 10 teaspoonfuls, or ⅔ of an ounce, to 1 gallon of water is recommended by the United

FIG. 38. *The destructive work of cabbage worms. When the sun grew hot this gardener lost interest and neglected his spraying.*

States Department of Agriculture for a small garden. Repeat the application every two or three weeks if the worms and beetles continue upon the cabbage.

Use of a "sticker." The adhesiveness of arsenate of lead is enhanced by the addition of a "sticker" of about the same quantity in weight of resin fish-oil soap, or other soft or dissolved soap, as of the arsenical used. The "sticker,"

according to *Farmers' Bulletin 856*, will prevent the foliage of cabbage and similar smooth-leaved crops from repelling the liquid. Without the "sticker" the poison may gather in drops and not be equally distributed over the foliage. Foliage successfully treated will show a thin white coating of the poison for some time.

Sprays to destroy plant-lice. To destroy the plant-lice known as the cabbage aphis, turnip aphis, and spinach aphis, as well as leaf-bugs, leaf-hoppers, and thrips, spray plants with dissolved cresol soap or resin fish-oil soap at the rate of 1 pound to 6 gallons of water.

STUDY OUTLINE

1. Name five insect enemies of the cabbage.
2. How is poison bait for cutworms prepared?
3. In what other way may cabbage be protected from cutworms?
4. How are cabbage-worms, cabbage loopers, and flea-beetles destroyed?
5. How are the cabbage aphis, turnip aphis, and spinach aphis destroyed?

HOME AND COMMUNITY WORK

Make a survey of twelve home gardens in your community and if possible secure the following information:

1. What insect enemies of cabbage are most common in these gardens?
2. What methods are used to destroy them?
3. Which seems to be the most satisfactory?

CHAPTER XXXIII

BEETS

Soil and climate. Beets can be grown in almost any climate. They do best in a moist, well-drained soil. This crop grows well in cool climates, therefore the larger crops are grown in the North. The seed may be planted as early as the ground can be worked in the spring. It is not necessary for the ground to be warm.

Courtesy Livingston Seed Company

FIG. 39. *A fine specimen of Crosby's Egyptian beet.*

Planting and cultivation. The seed should be planted about 1 inch deep, at the rate of 2 ounces to 100 feet of row space. The rows are usually placed about 12 or 18 inches apart. The plants should be thinned so that they stand about 6 inches apart in the row. Do not throw away the plants taken out. Transplant them to other garden space, if you have it, or use the tops for greens. Perhaps some young gardener in the neighborhood would be glad to have your surplus plants. To insure a supply of young tender beets throughout the season it is

advisable to make three or four plantings. Under favorable weather conditions, beets (Fig. 39) will be ready for use in from 60 to 80 days.

Insect enemies. The beet army worm and several kinds of webworm damage the beet by feeding on the foliage. They may be controlled by the use of arsenate of lead as already described. Flea-beetles are very destructive to the beet. To destroy them the plants should be sprayed with Paris green. For method consult Chapter XXXII.

Varieties. Four varieties of beets that experience has proved to be reliable are:

Crosby's Egyptian	Yellow Turnip
Detroit Red	Eclipse

STUDY OUTLINE

1. What climate is most suitable for growing beets?
2. In what ways may extra beet plants and beet tops be used.
3. Name some insect enemies that destroy the beet.
4. How are these enemies controlled?
5. Name two reliable varieties of beets.

HOME AND COMMUNITY WORK

1. What use is made of the extra beet plants and tops in gardens near your home?
2. What insect enemies are common in your locality?
3. What is done to control them?
4. What varieties of beets are most commonly grown?

CHAPTER XXXIV

PARSNIPS

Soil and climate. Parsnips (Fig. 40) are very easily grown when the soil is rich and mellow. When this condition prevails they will grow in almost any part of the country.

Planting and cultivation. Parsnip seed may be planted as early in the spring as the soil can be put in good condition. Use ½ ounce of seed to 100 feet of row space, planting the seed ½ to 1 inch deep. The plants should be thinned to 2½ inches apart. The plants taken out can be transplanted to other garden space. When this is done the soil should be made very mellow to a depth of 6 or 8 inches. Very loose mellow soil is necessary to produce smooth roots.

The rows should be 12 to 18 inches apart. Frequent cultivation is necessary.

Wintering parsnips in the ground. The roots of parsnips may be used in the fall, but their quality is improved if they are left in the ground until spring. This makes them sweeter. They should be dug, however, before they begin to grow, as sprouting makes them unfit for table use. In addition, parsnips produce seed the second season, and if the roots are left in the ground to mature and bear seed, this seed will scatter and the result will be a weedy garden.

Companion crops. Lettuce, radishes, and onions may be used as companion crops for parsnips.

Enemies. The parsnip is not seriously injured by insect enemies or plant diseases. If webworms appear, spray with arsenate of lead, as already described (Chapter XXXII).

FIG. 40. *Parsnips. Experienced householders who grow their own parsnips allow them to remain in the ground all winter.*

Varieties. Two leading varieties of parsnips which may be recommended to the young gardener are:

Hollow Crown Sugar

STUDY OUTLINE

1. What methods are commonly used for planting and cultivating the parsnip?
2. Why are parsnips left in the ground over winter?
3. What crops may be used as companion crops for parsnips?
4. What insects occasionally injure parsnips?
5. Name two leading varieties of parsnips.

HOME AND COMMUNITY WORK

1. Are parsnips very generally grown in your neighborhood?
2. Are they left in the ground over winter or dug and placed in storage?
3. What crops are used as companion crops with parsnips?
4. What insects, if any, have injured them?
5. What varieties are grown?

CHAPTER XXXV

CARROTS AND CHERVILS

CARROTS

Soil and climate. The soil and climatic conditions under which parsnips do best are also favorable to the carrot.

Planting and cultivation. Carrot seed should be planted ½ inch deep, using 1 ounce to 100 feet of row space. The plants should stand 2 inches apart in the rows. If they are too thick thin the rows and transplant your surplus plants to other garden space. Cultivation should begin when the plant is an inch high. By marking the rows with button radishes, cultivation may begin before the young plants have come through the ground. The growth may be hastened by the application of a small amount of fertilizer on each side of the row. When plants are large enough to touch each other in the row, the larger carrots should be pulled for table use (Fig. 41).

FIG. 41. *Carrots. The carrot is rapidly growing in favor as a table vegetable.*

Insect enemies. Cutworms sometimes do a great deal of damage to carrots. If they are in the garden use the cutworm bait as suggested (Chapter XXXII).

Varieties. If the carrots are planted in a clay soil that tends to become hard, the short variety known as the Golden Ball should be used. Some of the longer varieties are later and require soil that is deep and mellow for most successful development. A few varieties of both kinds are:

EARLY	LATER
Golden Ball	French Forcing
Early Scarlet Horn	Half Long Scarlet Oxheart
	Long Orange

CHERVIL

Two types of chervil are grown. The salad type, which is much like parsley, is not often found in American gardens. The seed for this is sown in the spring. The other type is known as the turnip rooted chervil. The seed is sown in early fall, but it does not germinate until spring. The edible part of this plant is the root. It closely resembles the carrot and is used in the same way for the table. The leaves are used either for garnishing or for flavoring soups.

STUDY OUTLINE

1. What companion crop is used for marking the carrot rows?
2. How should carrots be planted and cultivated?
3. What insect enemy attacks the carrot?
4. Name two varieties of carrots suitable for early planting and two suitable for late planting.
5. Name two types of the chervil. How is each used?

HOME AND COMMUNITY WORK

1. Name two varieties of carrots grown in your neighborhood.
2. Has the chervil also been grown there? If so, which type?
3. Can you tell where the salad chervil has long been popular?

CHAPTER XXXVI

TURNIPS AND RUTABAGAS

TURNIPS

Soil and climate. The *turnip* does best in a cool, moist climate, but will grow in nearly all sections of the country. The fact that it is such a hardy vegetable makes it a popular crop for cool latitudes. It is grown most successfully in a rich, mellow soil.

Planting and cultivation. Two crops of turnips can be raised in one year (Fig. 42). For the early crop plant as soon as the soil can be worked. Use ½ ounce of seed to 100 feet of row space. Plants should number 6 or 7 to a foot. Rows are usually 12 to 18 inches apart. The roots of the early crop will be ready for use before the weather gets hot. The late crop is usually sown broadcast on land occupied by early

FIG. 42. *Turnips. To the gardener who is looking for quick returns the turnip affords one of the most satisfactory crops.*

vegetables. Seed may be sown for the late crop from the last of July until the middle of August. It should be covered ¼ to ½ inch deep with fine soil. When turnips are sown broadcast, use 2 pounds of seed to an acre. To determine the quantity of seed necessary for your garden space find what part of an acre is comprised in the space. Stir the ground frequently for the cultivation of an early crop, and keep the soil free from weeds. When the seed is sown broadcast, pull weeds by hand and use a hand hoe for loosening the soil among the turnips if it seems necessary.

Varieties. Good varieties of the turnip which may be safely recommended are:

Purple Top Globe
White Globe

RUTABAGAS

The *rutabaga* is commonly known in England as Swedish turnip. The yellow-fleshed root is the variety most widely cultivated here. Its culture is the same as that for the turnip except that the rutabaga requires a longer period and more room for growing.

Enemies. The insect enemies of the turnip and the rutabaga are the same as those of the cabbage. Clubroot is the most serious disease that attacks these plants. The remedies for destroying the insects, as well as the way in which clubroot may be prevented are the same as already given for cabbages (Chapters XXXI and XXXII).

Varieties. Leading varieties of the rutabaga are:

Large White Purple Top

STUDY OUTLINE

1. Where is the turnip most successfully grown?
2. Tell when and how seed is sown for the early crop; the late crop.
3. Name two popular varieties of the turnip.
4. Name two varieties of the rutabaga.
5. What plant disease injures turnips and rutabagas?

HOME AND COMMUNITY WORK

1. In your community what varieties of turnip are grown? of the rutabaga?
2. Do you know anyone who grows this white-fleshed variety?
3. What varieties of each are most successful?
4. Have any crops in your neighborhood been injured by either diseases or insects?
5. If so, which did the most damage?

CHAPTER XXXVII

IRISH POTATOES

The Irish potato is a native of America, but after its introduction into Ireland because of famine it became the staple food of that country, and so it has come to be called the Irish potato.

Soil and climate. The Irish potato is grown successfully in nearly every section of the United States and in many countries of the Old World. It grows best in a well-drained sandy loam that is rich in humus.

Planting and cultivation. Irish potatoes should be planted in rows 2 to 2½ feet apart, and 4 to 6 pounds of seed should be used for 100 feet of row space (Fig. 8). The potatoes, or "tubers," are planted 3 to 4 inches deep and the plants should stand about 15 inches apart in the row. Cut seed potatoes so that there will be three good eyes in each piece to be planted. Each piece should weigh about 2 ounces. For example, a potato weighing 6 ounces should be cut so as to produce 3 pieces of seed. Potatoes that are intended for seed should be saved from the hills producing the largest yield and where there have been no traces of plant disease.

Early potatoes should be planted as soon as the ground can be worked. Late potatoes may be planted from the last week in May to the first week in July. Potatoes require considerable water to make successful growth. For this reason the moisture in the ground should be conserved by frequent cultivation. Toward the last of the growing season

pull the dirt up well around the vines to protect the tubers from the sun after the vines die.

Treatment for scab. If the seed potatoes have rough-pitted spots upon them they should be treated for the disease known as "scab," which is due to a parasite living in the soil. Formalin is used for treating potatoes with scab. It is a clear solution of 40 per cent formaldehyde gas in water. Use 1 ounce to 2 gallons of water, or 1 pint to 30 gallons if a large number of potatoes are to be treated. This solution may also be used to treat onions, seeds of any kind, and even the soil, to prevent plant diseases. If potatoes have scab the second year, be sure to secure a new location for the crop.

Enemies. The Irish potato has many enemies, but the Colorado potato beetle (Fig. 26) and late blight are considered the greatest. For the Colorado, blister, and flea beetles spray with Paris green or arsenate of lead, as described (Chapter XXXII). Repeat the spraying application every two weeks if the beetles continue to appear. For both early and late blight, spray with Bordeaux mixture, using a hand sprayer where only a small garden is being treated. To prevent early blight, spray first when the plants are 3 or 4 inches high, following with two or three other sprayings about two weeks apart. If late blight is observed it may be necessary to spray four or five times. All applications should be two or three weeks apart.

Bordeaux mixture. In preparing Bordeaux mixture use ¼ pound of unslaked lime, ¼ pound of copper sulphate, and 3 gallons of water. Slake the lime in half of the water and dissolve the copper sulphate in the other half. Stir the two well together. Spray without diluting.

Varieties. Some popular and satisfactory early and late varieties of potatoes are:

EARLY	LATE
Early Ohio	Green Mountain
Early Rose	Rural New Yorker
Irish Cobbler	Sir Walter Raleigh

STUDY OUTLINE

1. What are common rules for planting the Irish potato?
2. State two important points in preparing seed potatoes for planting.
3. How should seed potatoes with scab be treated?
4. How should seed potatoes be selected?
5. What are the greatest enemies to the potato?
6. How may these be controlled?
7. How is Bordeaux mixture prepared?
8. Name two early varieties of potatoes; two late varieties.

HOME AND COMMUNITY WORK

1. What is the chief source of seed potatoes in your neighborhood?
2. What enemies do most damage to the potatoes?
3. What methods are used to prevent diseases? To destroy insect pests?
4. Are both early and late potatoes grown? Name the varieties.

CHAPTER XXXVIII

SWEET POTATOES

Soil and climate. The sweet potato (Fig. 43) belongs to the morning-glory family and as a general thing requires entirely different treatment from that given the white potato. It grows best in the South because of its tropical nature. It is best adapted to a warm, well-drained, sandy loam soil. The sweet potato is grown extensively for commercial purposes as far north as the southern boundary of Pennsylvania. It may be grown in a limited way for family use in southern New York and Michigan.

Planting and cultivation. Sweet potatoes are usually planted in ridges 3 to 5 feet apart so as to insure good drainage. In a large garden these ridges may be made by throwing two plow furrows together; in a small garden by the use of the spade, shovel, or hand hoe. A good application of fertilizer should be mixed with the soil of which the ridges are composed.

Plants should be started in a hotbed. This insures early development and a longer season for the crop's growth. They should be planted 12 to 14 inches apart in the row. Cultivate frequently and thus keep the soil free from weeds and provide a surface mulch. After the vines cover the ground there is no further need of cultivation.

Insect enemies. The cutworm is an enemy of the sweet potato and frequently destroys many plants. For the control of this pest consult Chapter XXXII.

FIG. 43. *Sweet potato tubers. The sweet potato, one of the most important crops grown in the South, in suitable locations will thrive and yield abundantly in Northern gardens.*

Varieties. Among the varieties of sweet potatoes grown the leading ones are:

Improved Jersey Triumph

STUDY OUTLINE

1. Why does the sweet potato do best in the South?
2. How are sweet potatoes planted and cultivated?
3. What insect frequently does injury to the young sweet potato plants?
4. How may it be destroyed?
5. Name two leading varieties of the sweet potato.

HOME AND COMMUNITY WORK

1. Is the sweet potato grown in your neighborhood? If so, what variety is commonly planted?
2. Tell how it is grown and cultivated.
3. Have insects ever injured the crop?
4. What methods have been used to destroy them?

CHAPTER XXXIX

PEPPERS AND EGGPLANTS

PEPPERS

Climatic conditions. Peppers grow well throughout a large part of the country (Fig. 44). The plants are tender, therefore they should not be planted out until after all danger of frost is past.

Planting and cultivation. Pepper plants can be raised in an indoor seed box or a hotbed. In this case the seeds should be planted about eight weeks before the time for transplanting to the garden. Plants should be set 12 to 18 inches apart in the rows. The distance between the rows

FIG. 44. *Green peppers. Sweet peppers add an appetizing flavor to salads and other dishes. They are now cultivated in many gardens.*

FIG. 45. *Eggplant. The eggplant reaches perfection in our hot dry summers. This plant is becoming more common in the home garden.*

should be 2½ to 3 feet. Where seeds are sown in the open ground use ⅛ ounce to 100 feet of row space, planting ½ inch deep. Peppers under favorable conditions mature in from 100 to 140 days.

Varieties. Some varieties of peppers that have been successfully grown are:

SWEET	HOT
Bull Nose	Long Red Cayenne
Sweet Spanish	Red Cluster

EGGPLANTS

Planting and cultivation. Eggplant seed should be sown in an indoor seed box, hotbed, or green house about two months before time to set out the plants in the garden,

which should not be done until after all danger of frost is over. Plant them 18 to 24 inches apart in rows 3 feet apart.

Keep the rows free from weeds and the soil thoroughly cultivated. If the soil is rich, 12 or 15 good plants will be sufficient to supply a family of four (Fig. 45). The eggplant is injured by the same enemies that trouble the white potato (Chapter XXXVII).

Varieties. Among varieties to be recommended for the home garden are:

Florida High Bush
Black Beauty

STUDY OUTLINE

1. What culture is required for peppers and eggplants?
2. Name one variety of sweet peppers and one of hot peppers.
3. Name two varieties of eggplant.
4. What enemies injure the eggplant?
5. How are these controlled?

HOME AND COMMUNITY WORK

1. What types and varieties of peppers are grown in your neighborhood?
2. What use is made of them?
3. What kinds of eggplants have been grown?
4. Find out, if possible, the normal yield in one season from one dozen eggplants.

CHAPTER XL

TOMATOES

Soil and climate. Tomatoes are grown in nearly all gardens (Fig. 46). Some gardeners succeed best with them when they are grown in a fertile sandy loam with well-drained clay as a subsoil.

Planting and cultivation. Plants for home use may be procured by planting seeds in an indoor seed box eight weeks before time for setting out in the garden. When 2 inches high the plants should be transplanted to another

FIG. 46. *Tomatoes. The fruit of this plant once thought to be poisonous is now one of the most popular and widely used of our garden vegetables. It reaches its greatest perfection in American gardens.*

box, hotbed, or cold frame. They should be placed 2 or 3 inches apart in the new location. When the plants begin

to crowd under these conditions, transplant each one to a separate container. Use clay or paper flower pots or old strawberry boxes for this purpose. When all danger of frost is over, remove the plants from the pots, being careful

FIG. 47. *The gardener who trains his tomatoes to stakes finds it easier to cultivate, spray, and harvest his crop, and will have an added satisfaction in the neat appearance of his garden.*

to keep all dirt upon the roots, and set them out in the garden. If berry boxes are used, cut the bottoms out and place the boxes in the row.

Staking and pruning. If the plants are to be pruned to one or two stems and staked up, when setting them out the best way is to put them 18 inches apart in rows 3 feet apart. If plants are not to be pruned, put them 3 feet apart in rows 4 feet apart.

The advantages resulting from staking and pruning are:

1. The fruit ripens earlier.
2. Fungous diseases are diminished.
3. Spraying, cultivation, and harvesting are more easily accomplished.
4. Space is economized.

Insect enemies. Flea-beetles, tomato worms, and cutworms are common enemies of the tomato. Flea-beetles and tomato worms may be repelled by thoroughly spraying the plants with arsenate of lead. For the use of this poison see Chapter XXXII. The control of the cutworm is also discussed in that chapter.

Diseases. The tomato is subject to a number of plant diseases. These may usually be controlled by regular applications on a clear day of Bordeaux mixture before the diseases appear (Chapter XXXVII). This mixture should be applied to the plants shortly after they come up in the seed box and every two weeks thereafter until the crop is harvested (Fig. 47).

Varieties. A few of the varieties of tomatoes that have been widely used are:

EARLY	MEDIUM AND LATE	
Earliana	Globe	Ponderosa
John Baer	Red Rock	Matchless
Acme	Stone[1]	

STUDY OUTLINE

1. Describe some methods of planting and cultivating tomatoes.
2. Tell how to stake and prune tomato vines. What advantages, if any, will result?

[1] The Stone variety is used for canning.

3. What insects and plant diseases injure tomatoes?
4. What are the best remedies to use?
5. Name varieties of tomatoes that are planted early; varieties that are planted for medium and late crops; a good canning variety.
6. Find out and report items concerning the origin and history of the tomato.

HOME AND COMMUNITY WORK

Visit among the gardens in your neighborhood and be prepared to answer the following:

1. How are the tomato vines usually supported?
2. Are the vines pruned?
3. What enemies do them most injury?
4. What methods are used to control these enemies?
5. What varieties of tomatoes are most popular?

CHAPTER XLI

BEANS

Classes and kinds. Beans are divided into two general groups or classes, field beans and garden beans. Here we shall consider only the garden type. It includes both bush and pole beans, and both of these are also further divided into two classes, kidney and lima. The kidney pole and the kidney bush beans are of two kinds, wax and green-pod. Some gardeners classify beans as snap, string, green shell, and dry shell, in order to distinguish the different kinds.

Snap or string beans (Fig. 48) may be eaten while the pods are green. Green shell beans are eaten before the crop is ripe. Dry shell beans are eaten after the beans are fully ripened and have become dry. Green shell beans may be used like the dry shell kinds, if they are allowed to remain on the vines and ripen thoroughly.

Where beans are grown. Beans are grown in all kinds of soil and in gardens in almost all parts of the world. They should not be planted in a rich muck soil as they will then go to vine; that is, many and large vines will be produced but they will bear very few beans. No kind of bean can stand a heavy frost. Beans, therefore, should not be planted until all danger of frost is over.

Planting and cultivation. The *bush* varieties are more hardy than the pole beans, therefore they can be planted earlier. The lima bean requires a longer season for maturing. The dwarf varieties of the string bean mature quickly,

therefore they are some of the first beans to be found on the market. When planting bush beans place the seed in rows 18 inches apart and ½ to 1 inch deep in the soil, using 1 pint of beans to 100 feet of row space with plants 6 inches apart.

Plant *pole* beans in hills 4 feet apart each way and 4 beans in a hill, using ½ pint of seed to 100 feet of row space. Cover the beans 1 inch deep with fine soil. Drive an 8-foot pole 10 inches deep into the soil in each hill. Slant the poles in two adjoining hills in two adjoining rows in such a way that they may be tied together at the top in Indian wigwam fashion. The beans will climb and cling to the poles. Pole beans may be planted with sweet corn, and the vines permitted to climb the corn stalks. Occasionally beans are planted in rows and the vines permitted to run on wire netting placed for this purpose. Beans should not be cultivated when the dew is on the leaves or when the vines are wet with rain. Frequent shallow cultivation is necessary.

FIG. 48. *Green or snap beans.*

Varieties. The following varieties have proved satisfactory throughout a large territory:

BUSH GREEN	POLE GREEN	BUSH LIMA	POLE LIMA
Green Pod	Kentucky Wonder	Landreth	Seibert
Red Valentine		Burpee's Bush	Ideal

STUDY OUTLINE

1. Into how many general groups are beans divided, and what are they?
2. Into what two divisions is the garden bean divided?
3. How are the bush and pole beans further divided?
4. Into what divisions are the kidney pole and the kidney bush beans divided?
5. What other names are used to distinguish the different kinds of beans?
6. Why should we avoid planting beans in a very rich soil?
7. Give methods used in planting bush beans; pole beans.
8. How and when should they be cultivated?
9. Name some leading varieties of beans.

HOME AND COMMUNITY WORK

1. What types and varieties of beans are most commonly raised in your community?
2. Which varieties seem to give the best satisfaction there?
3. What methods are used for growing the different kinds?
4. What plant diseases and enemies do the most injury?
5. How are these diseases and enemies prevented from injuring beans?

CHAPTER XLII

BEAN ENEMIES AND THEIR CONTROL

Diseases. Bean anthracnose is a fungous disease which attacks the stem, leaves, pods, and seeds of the bean plant. The disease may be detected by the spots or cankers that have pink centers surrounded by a darker reddish border. It may be prevented by selecting healthy seed and by rotation of garden crops. Bean blight produces irregular, diseased areas which, according to *Farmers' Bulletin 856*, at first have a water-soaked appearance but later dry out and become brown and brittle. When a bean seed is affected with blight it shows yellow blotches and sometimes becomes entirely yellow and shriveled. Blight may be prevented by using the same remedies that have been suggested for anthracnose.

Downy mildew sometimes attacks lima beans. Spraying with Bordeaux mixture at ten-day intervals is recommended for the prevention of mildew (Chapter XXXVII).

Insects. The most harmful insect enemy of the bean is the bean weevil. This cannot be controlled in the field or garden but only through the seed. As soon as the crop is harvested, the beans should be fumigated with carbon bisulphide. For details concerning this process consult *Farmers' Bulletin 799*.

The bean ladybird, leaf-beetle, and blister beetle may be repelled by spraying with arsenate of lead (Chapter XXXII). When beans are young the vines are very tender, therefore at this stage of their growth the preparation

applied should be only one-half strength to avoid burning the plants.

The bean aphis is a plant-louse that may be controlled by the use of nicotine sulphate. For a small garden use 1 teaspoonful to 1 gallon of water, to which add a 1-inch cube of hard soap after it is thoroughly dissolved. For a larger garden 1 fluid ounce to 8 gallons of water is recommended by *Farmers' Bulletin 856*. When this quantity is used ½ pound of soap should be dissolved in the poison mixture.

The melon aphis, pea aphis, cabbage aphis, turnip aphis, and spinach aphis may also be controlled by the use of nicotine sulphate.

STUDY OUTLINE

1. What is bean anthracnose? How may it be detected and how prevented?
2. How may we detect bean blight? How prevent it?
3. How may downy mildew be prevented?
4. How is Bordeaux mixture prepared?
5. What insect is most harmful to the bean? How is it prevented from injuring beans?
6. What other insect enemies have beans? How prevent them from injuring beans?

CHAPTER XLIII

SWEET CORN AND POP CORN

SWEET CORN

Soil and climate. Sweet corn is grown throughout a large area of our country and under many different conditions of soil and climate. Generally speaking, conditions favoring field corn are satisfactory for sweet corn.

Planting and cultivation. Sweet corn should be planted as early as the ground can be worked and the soil becomes warm. Use ¼ pint of seed to 100 feet of row space. The hills should be 3 feet apart, with 4 grains in a hill, covered 1½ inches deep. If corn is planted in rows, the plants should be thinned to 15 inches apart in the row. Sweet corn should be planted every three weeks until late summer. By this means there will be a continuous supply of green corn for the table. Some gardeners attain the same result by planting early, medium, and late varieties. Sweet corn should be used as soon as possible after the ears are removed from the stalks as it loses its flavor very quickly.

FIG. 49. *Golden Bantam sweet corn.*

Keep the soil loose and free from weeds by frequent cultivation. At

the last cultivation the soil should be pulled around the stalks to give them support.

Enemies. The corn root-aphis is an enemy that may be controlled by crop rotation, a free use of fertilizers to stimulate plant growth, and by plowing or spading the soil in the fall.

The corn earworm, another enemy, may be killed by applying arsenate of lead to the silk early in the season, repeating the application if the worms do not disappear. Late sweet corn is less liable to attack from this pest than the early crop.

Cutworms and flea-beetles may be controlled by the methods suggested in Chapters XXXII and XXXVII.

Diseases. Bacterial blight sometimes attacks sweet corn. It may be partially controlled by destroying infected seed and rotating crops. If smut boils appear, cut and burn them before they mature and burst.

Varieties. Sweet corn is one of our most popular vegetables. Some of the best known varieties are:

EARLY	MEDIUM AND LATE
Golden Bantam	Country Gentleman
Black Mexican	Evergreen

POP CORN

Planting and cultivation. Pop corn is grown practically in the same way as sweet corn. It is a very common crop throughout the corn belt. Pop corn must not be planted too thick. Experienced gardeners recommend that it be planted in hills 30 to 36 inches apart and thinned to three stalks in a hill. When cultivated with horse-drawn tools the rows also should be 30 to 36 inches apart, but when it is to be cultivated by hand 24 to 28 inches are sufficient.

Great care is necessary in the curing and storing of pop corn. After it has been husked clean, it is frequently placed on shelves in the pantry to dry. Pop corn will not pop until it is dry. On the other hand, sometimes old pop corn gets too dry and fails to pop. When the corn is fairly dry place it for storage in well-ventilated containers that are protected from mice. If space and conditions permit, spread out on the floor in a dry room.

Varieties. There are three standard varieties of pop corn, the first two of which pop best, while the last is particularly suited for stringing and coating with sugar:

Rice (rough-kerneled)
Pearl (smooth, small-kerneled)
Yankee (smooth, large-kerneled)

STUDY OUTLINE

1. What culture does sweet corn require?
2. Name the most important enemies of sweet corn.
3. How may we prevent these from injuring the corn?
4. Name one early, one medium, and one late variety of sweet corn.
5. Name three varieties of pop corn and the uses made of each variety.

HOME AND COMMUNITY WORK

1. What varieties of sweet corn are most satisfactory to the gardeners of your neighborhood?
2. What enemies have they found do this crop the most injury?
3. What methods are used in your neighborhood to prevent these enemies from injuring the crop.

CHAPTER XLIV

CUCUMBERS

Soil and climate. The cucumber requires a rich, mellow soil and a warm climate for its best development. Stable or commercial fertilizers should be put in the cucumber hills or rows.

Planting and cultivation. Cucumbers are easily injured by the cold. For this reason, do not plant the seed until all danger of frost is over. To secure an early crop, plant seed in plant bands, berry boxes, or inverted sods, placing these containers in an indoor box or hotbed. Transplant the plants directly to the garden, leaving them in the containers. When seed is planted in the open in rows, use ½ ounce to 100 feet of row space. Plant 1 inch deep and make the rows 5 or 6 feet apart. When planted in rows thin the plants to stand 18 inches apart. When planted in hills use 10 or 12 seeds to the hill and thin them to 3 strong plants in each hill (Fig. 50). Young cucumber plants are destroyed in great numbers by the cucumber beetle, therefore it is important to have surplus plants in the hills or rows.

Cucumbers should be given frequent cultivation while the vines are small. After the vines have grown to cover most of the row space all weeds should be pulled by hand. During the early season the fruit should be removed from the vines before it is allowed to ripen. This stimulates the vines to greater productiveness.

Companion crops. Early bunch beans, lettuce, or radishes can be used as companion crops with cucumbers.

Enemies. The striped and the twelve-spotted cucumber beetles are the greatest insect enemies of the cucumber. If the garden contains only a few plants make small frames covered with cheesecloth to protect them from the beetles. A solution made by mixing arsenate of lead and a small

FIG. 50. *Three choice cucumbers. Every garden should have a few cucumber hills. If garden space is limited plant seeds near the fence and encourage the vines to climb and cling to the wire or board.*

quantity of Bordeaux mixture will repel or destroy the beetle and prevent its injuring the foliage.

The melon aphis is another of the special enemies of the cucumber. To destroy it follow the suggestions in Chapter XLII.

Protecting cucumber plants from the beetles also helps to keep them free from diseases. If wilt, anthracnose, and downy mildew appear, spray with Bordeaux mixture.

Varieties. Good varieties widely and successfully grown by gardeners are:

Emerald White Spine

STUDY OUTLINE

1. How should cucumbers be planted to secure an early yield?
2. Why should the fruit in the early season be removed from the vines before it is allowed to ripen?
3. Suggest companion crops suitable to be planted with cucumbers.
4. What are the most harmful enemies of the cucumber?
5. How may they be prevented from injuring the vines?
6. What plant diseases attack the cucumber?
7. How may they be prevented?
8. Name two well-known varieties of the cucumber.

HOME AND COMMUNITY WORK

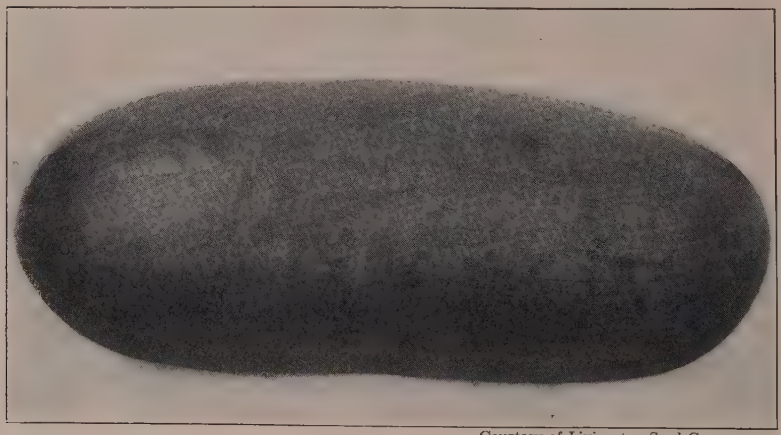
1. Are cucumbers cultivated in the gardens of your community?
2. If so, what companion crops, if any, are planted with them?
3. What insect enemies have been reported? What plant diseases noticed? State methods used to control these enemies.
3. What varieties of cucumbers are grown in the gardens of your neighborhood?
4. What kinds have proved most successful?

CHAPTER XLV

MELONS

Soil and climate. Soil, climatic conditions, and cultivation required, as well as remedies for protection from insects and diseases, are about the same for melons as for cucumbers.

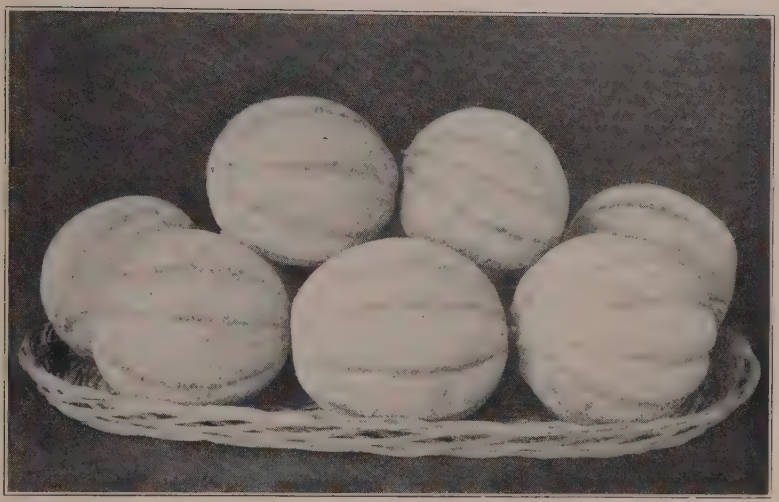
Watermelons. Watermelons (Fig. 51) should be in hills from 8 to 10 feet apart each way. Plant 10 to 12 seeds in each hill. Thin, leaving 3 good plants in each hill. When planting in rows make them 8 feet apart. Thin the plants so that they will stand 30 inches apart in a row.



Courtesy of Livingston Seed Company

FIG. 51. *A watermelon of the Tom Watson variety. A melon that ripens in your own garden has a finer flavor than one from the market. Plant a few hills.*

Muskmelons. Muskmelons (Fig. 52) may be in hills 6 feet apart each way. Plant 10 to 12 seeds in each hill. Thin, leaving 4 of the best plants in each hill. When planting



Courtesy of Livingston Seed Company

FIG. 52. *Ohio Sugar muskmelon. This melon, one of the most delicious of our garden products, may be grown almost anywhere.*

in rows put the seeds 6 to 8 feet apart. Thin the plants so that they will stand 20 inches apart in a row.

Citron melons. The citron melon is a type of watermelon. It has solid flesh which is much used for preserves or sweet pickles. Directions for the cultivation of the citron melon are the same as for watermelon.

Enemies. The insect enemies and plant diseases of melons are the same as those of cucumbers. For their control see Chapter XLIV.

Varieties. Some varieties of melons that have proved both successful and popular are:

WATERMELON	MUSKMELON	CITRON MELON
Tom Watson	Rocky Ford	Colorado Preserving
Florida Favorite	Ohio Sugar	

STUDY OUTLINE

1. What conditions of soil and climate do melons require?
2. Suggest methods for planting muskmelons.
3. Name two varieties of muskmelons.
4. How are watermelons planted?
5. Name two varieties of watermelons.
6. What enemies injure melons? How is each controlled?
7. What is the citron melon? How is it grown?

HOME AND COMMUNITY WORK

1. What melons are grown in the gardens of your neighborhood?
2. What methods did the gardeners use in growing melons?
3. What enemies have done injury to the crop?
4. What means were used to destroy the enemies?

CHAPTER XLVI

SQUASHES—VEGETABLE MARROWS—PUMPKINS

SQUASHES

The squash is a good plant to grow in corners or other spaces in the garden that might not otherwise be utilized. Squashes are sometimes planted so that the vines may grow over ash-piles, rough banks, or over unsightly places in the back yard, in vacant lots or in the garden (Fig. 54).

There are two kinds of squash adapted to garden culture, summer squash (Fig. 53), which usually keeps only a short time after it is removed from the vine, and winter squash

FIG. 53. *A good summer squash. This variety, commonly known as the "Patty Pan," matures early and will thrive in any odd corner of the garden plot.*

which is gathered about the time of the first frost and may be kept through the winter.

Soil and climate. Squashes require a rich mellow soil. They are very easy to grow and thrive in most all parts of the country.

Planting and cultivation. Summer squash should be planted in hills 4 feet apart, and winter squash 6 to 8 feet apart each way. The seed should not be planted in the open until all danger of frost is past. For an early crop seed may be planted in sods, seed boxes, or plant bands, as recommended for cucumbers (Chapter XLIV). Started in this way the crop should be ready for the table by July. Winter squash seed may be planted as late as July 1, except in the northern states.

FIG. 54. *Summer squashes grown by school children of the first grade.*

The cultivation and care of the squash is the same as that already suggested for cucumbers and melons.

Enemies. The insect enemies mentioned in connection with the cucumber (Chapter XLIV) sometimes attack squash. Squashes frequently escape attacks from cucumber beetles and the melon aphis but are injured by the squash bug commonly known from its odor as the "stink bug." This insect like the aphis is a sucking insect, and cannot therefore be poisoned with arsenate of lead or Paris green. The bugs are large and may be hand-picked and killed. They may also be controlled by the use of nicotine sulphate (Chapter XLII). Some gardeners trap squash bugs by placing shingles or small boards among the vines. The bugs take shelter there at night, and by examining these sheltered places in the mornings early in the season they may be caught and killed.

Varieties. Good varieties of summer and winter squash to grow are:

SUMMER	WINTER
Summer Crookneck	Hubbard
Early Jersey	Delicious
White Bush	
Yellow Custard	

VEGETABLE MARROWS

Vegetable marrows resemble pumpkins in appearance and habits of growth. They should be gathered while the outer skin is sufficiently tender to be broken by the finger nail. When taken while young and tender vegetable marrows may be baked and served like sweet potatoes, and when fried they are considered superior to eggplant. They have long been popular in England and are now coming to be better known in this country.

PUMPKINS

The soil and climatic conditions required by pumpkins are the same as those that are best for squashes (Fig. 55). Pumpkins may be planted in hills 8 to 10 feet apart. They should be considered a field crop, and are often planted in the corn rows. When replanting or hoeing corn, farmers usually plant pumpkin seed in the space where no corn has come up. Pumpkin seed should not be placed in the corn drill and planted at the same time the corn is planted. If this is done the pumpkin seed frequently prevent the grains of corn from passing uniformly through the corn drill.

FIG. 55. *"Some pumpkins." This Gary, Indiana, girl, when told that pumpkins would succeed best in her sandy soil, determined to grow a maximum crop.*

This makes a uniform stand of corn impossible. The enemies of pumpkins are the same as those of squashes.

Varieties. Popular varieties of pumpkins are:

Burpee's Golden Oblong	White Cushaw
Small Sugar	Striped Cushaw

STUDY OUTLINE

1. What types of squashes are adapted to garden culture?
2. What culture is required for squashes and pumpkins?
3. What insect enemies injure these crops?
4. How may they be controlled?
5. Name two varieties of summer and two varieties of winter squashes.
6. Where are pumpkins usually grown?
7. What are vegetable marrows?
8. How may they be served?

HOME AND COMMUNITY WORK

1. What kinds of squashes are grown in your community?
2. Where are they usually planted?
3. Have any enemies attacked the squash or pumpkin crops in your neighborhood?
4. If so, what methods have been used to control them?

CHAPTER XLVII

CELERY AND CELERIAC

CELERY

Soil and climate. Celery is a popular garden crop to follow early vegetables. For successful growth it requires a deep, rich, loose, moist soil.

Planting and cultivation. Celery is usually planted in the garden space that has been utilized for early crops. When seed is planted, use ¼ ounce to 100 feet of row space and plant ⅛ of an inch deep. The plants should be thinned to stand 6 inches apart in the rows. The rows are usually made 3 to 5 feet apart. The plants should be kept free from weeds by hand-hoeing and frequent shallow cultivation. If it is desired to set out plants instead of sowing seed in the garden, sow the seed first in a hotbed or cold frame and transplant.

FIG. 56. *A stalk of celery.*

Blanching celery. As the plants grow, earth should be drawn up around them, in order to give the leaves support and to hold the stalks upright. This also aids the blanching process. If earth is used altogether for blanching care should be taken that it does not get into the hearts of the plants. In addition to earth, boards, paper, and drain tile may also be used for blanching celery (Figs. 57, 58 and 59).

FIG. 57. *Blanching celery with tile.*

Storing. If celery is desired for winter use it may be left in the garden or put in the cellar. If left outdoors the rows must be banked with earth and the tops covered with leaves or straw to prevent them from freezing. Perhaps the safer way for the inexperienced gardener would be to remove the plants to the cellar or storing pit. There they should be reset close together in loose earth brought for the purpose.

If celery is stored in cellars or pits it should be kept as cool as possible, but the temperature should not be below freezing.

Enemies. Early and late leaf-blight sometimes attack celery. They may be controlled by Bordeaux mixture applied every two weeks. The celery leaf-tryer, caterpillar and looper may all be controlled with arsenate of lead (Chapter XXXII). The tarnished plant-bug, another enemy, can be destroyed with nicotine sulphate (Chapter XLII). If insect enemies are not too numerous, it may be possible to overcome them by hand-picking.

FIG. 58. *Blanching celery by means of paper.*

FIG. 59. *Blanching celery with earth.*

Varieties. Two varieties among those that have proved satisfactory are:

Easy Blanching Columbia

CELERIAC

Celeriac is another kind of celery that is used only for its roots, which may be served either cooked or raw. The rules for its cultivation are the same as for celery, but of course it does not require blanching. By applying a light covering to avoid freezing, the roots may remain in the ground until used, or they may be stored like carrots.

STUDY OUTLINE

1. What culture is required for celery and celeriac?
2. Describe the various methods used to blanch celery.
3. How may celery and celeriac be preserved for winter use?
4. What enemies injure celery?
5. How are they destroyed?
6. Name two varieties of celery.

HOME AND COMMUNITY WORK

1. What methods are used for blanching celery in your community?
2. How are celery and celeriac preserved for winter use?
3. What enemies injure these crops in your neighborhood?
4. What methods are used to prevent their injuring the crop?

CHAPTER XLVIII

KALE AND CAULIFLOWER

Kale, cauliflower, collards, and Brussels sprouts are garden crops that are all related to the cabbage and are used as substitutes for it. Kale (Figs. 60 and 61) and collards are also used for greens. Since their uses and the culture they require are somewhat similar, they may be treated together.

KALE

Soil and climate. Kale is a very hardy plant, and where severe freezing does not continue too long it can be left in the ground all winter. It does best in a rich, mellow soil.

FIG. 60. *Kale. This plant is closely related to cabbage and is used chiefly as greens.*

Planting and cultivation. The culture of the plant is the same as that for cabbage (Chapter XXXI). Unlike cab-

FIG. 61. *A fine stand of kale. This crop is cultivated in the same manner as turnips.*

bage, kale produces no head but has convoluted leaves and a thick stem. It will produce continuously if only a few leaves are taken off at a time. Light frosts not only do not injure the plant but are thought greatly to improve its flavor.

Varieties. Two well-known varieties of kale are:

Dwarf Siberian

CAULIFLOWER

Soil and climate. Cauliflower requires a rich, moist soil. This plant will not stand as much frost as cabbage. Hence it should be planted early enough to mature before heavy frosts.

Planting and cultivation. The planting and culture of cauliflower are the same as for cabbage (Chapter XXXI). Cauliflower must be grown either early or late in the season, because in most localities it will not head properly in mid summer. The same treatment that is given late cabbage will usually prove satisfactory for cauliflower.

FIG. 62. *A cauliflower plant. Notice how the leaves are tied together to keep the sunlight from the head.*

To be kept white, the heads must be protected from too much light, by taking the longer leaves and pulling them up over the head and tying them together at the ends (Fig. 62).

Enemies. The enemies of kale and cauliflower are the same as those of cabbage (Chapters XXXI–XXXII).

Varieties. The most widely known variety of cauliflower is the Early Snowball (Fig. 63).

FIG. 63. *A fine example of Snowball Cauliflower.*

STUDY OUTLINE

1. What is the chief reason for producing kale and cauliflower?
2. Tell the soil and climate required for the production of kale.
3. What methods are used in producing kale? Name two varieties.
4. Describe the soil and climate required for the production of cauliflower.
5. How are the heads of cauliflower kept white?
6. What enemies injure kale and cauliflower?
7. How are these controlled?

HOME AND COMMUNITY WORK

1. How are kale and cauliflower used in your community?
2. What enemies injure these crops?
3. How are they controlled?

CHAPTER XLIX

COLLARDS AND BRUSSELS SPROUTS

COLLARDS

Soil and climate. Collards, like cauliflower, require a rich, moist soil. This plant will stand the heat better than either cabbage or kale. This makes it a valuable crop in the South where it is chiefly grown.

Description. Collards are sometimes called non-heading cabbage. Instead of a true head, a loose rosette of leaves is formed on the top of the tall, sturdy stem. When these are young they are very tender and have a delicate flavor. They are served as greens (Chapter LIII).

Planting and cultivation. The culture required for collards is the same as for late cabbage and kale (Chapters XXXI and XLVIII).

Varieties. The Creole variety is the one that is best known and most generally used.

BRUSSELS SPROUTS

Like kale and cauliflower Brussels sprouts are related to the cabbage, and all these crops require a similar culture.

Description. Brussels sprouts form a number of small heads in the axils of the leaves, instead of having a single head like cabbage. As these small heads grow and begin to crowd, the leaves should be removed from the stem of the plants to provide more space for the heads or sprouts. A few leaves should be left on the top of the plant.

Storing. Brussels sprouts are very hardy and can be left

out all winter in a mild climate. A better way, however, is to remove the plants containing the best formed heads to a cellar, storage pit, or cold frame. Place them close together and cover the roots with earth.

Enemies. The enemies of collards and Brussels sprouts are somewhat similar to those of cabbage. For their control see Chapters XXXI and XXXII.

Varieties. Not many varieties of this crop are offered by the seed houses, but satisfactory ones are:

Paris Market	Long Island Improved
Dwarf	Perfection

STUDY OUTLINE

1. Where are collards usually grown? Why is it a favorite crop in the South?
2. What part of the plant is used for food?
3. What other garden crops similarly used require the same culture as collards?
4. What is the best known variety of collards?
5. How are Brussels sprouts produced?
6. What enemies do injury to collards and Brussels sprouts?
7. How are they controlled?

HOME AND COMMUNITY WORK

Visit the gardens of your neighborhood and if collards or Brussels sprouts are cultivated there, be prepared to answer the following:

1. What methods of culture are given each?
2. What enemies, if any, have injured the crops?
3. What means were used to control them?

CHAPTER L

KOHL-RABI AND OKRA

KOHL-RABI

Culture. For an early crop kohl-rabi (Fig. 64) requires the same culture as cabbage (Chapter XXXI).

Description. While kohl-rabi belongs to the same family as the cabbage and cauliflower it is very different in appearance from either. When prepared for the table it more closely resembles turnips in flavor and texture than cabbage.

The part used for food is an enlarged portion of the stem just above the ground. These fleshy stems should be used when young and tender.

Courtesy of Livingston Seed Company

FIG. 64. *Kohl-rabi. This is an excellent vegetable for early summer use. The seed should be sown where it is to mature.*

Varieties. Good varieties of kohl-rabi that may be recommended to the young gardener are:

Early White Vienna
Early Purple Vienna

OKRA

Soil and climate. Okra does best in a rich soil and a warm climate and has usually been considered a southern crop. But with sufficient rainfall and a warm soil it will thrive and yield abundantly in the average home garden.

Courtesy of Livingston Seed Company

FIG. 65. *Okra blossom and pod. The large blossoms are attractive.*

Planting and cultivation. Prepare the land for okra after all danger of frost is over. The seed should be sown about the time beans are planted. It will take 2 ounces of seed to plant 100 feet of row space. The rows should be 4 feet apart for the dwarf kinds and 5 feet apart for the tall ones. The plants should be thinned to 2 feet apart in the row.

Edible parts. The seed pods (Fig. 65) are used when green and tender chiefly to flavor soups. If these are gathered just before

they ripen, the plants will continue to produce until killed by frost. The best pods are produced on young plants.

Varieties. Some varieties of okra that are grown with good success are:

Lady Finger Long Green Perkins Mammoth

STUDY OUTLINE

1. What culture do kohl-rabi and okra require?
2. What parts of these plants are used for food?
3. Name two varieties of kohl-rabi.
4. Name two varieties of okra.

HOME AND COMMUNITY WORK

Visit ten gardeners in your neighborhood and be prepared to answer the following:

1. How many have grown kohl-rabi and okra?
2. What varieties were most successful?
3. What enemies, if any, injured these plants?
4. What means were taken to control them?

CHAPTER LI

SPRING GREENS

The two leading garden crops used for "greens" in the spring are spinach and mustard (Fig. 67). Every gardener should make provision for the planting of one or both of these valuable crops.

Spinach. The most important plant grown exclusively for greens in America is *spinach* (Fig. 66). It is a cool-season crop, and for this reason should be planted in early spring or late fall. In the North when planted in the fall

FIG. 66. *A spinach plant. By growing this crop in spring and fall and New Zealand spinach during the summer the family may be provided with a continuous supply of greens.*

it should be protected from the cold during the winter by mulching with straw or leaves.

The seed of spinach is sown ½ to 1 inch deep and at the rate of 1 ounce to 100 feet of row space. The plants should stand about 7 or 8 to the foot. This crop requires a rich soil for successful growth. If the soil is not fertile, use a light application of nitrate of soda in the rows. When the seed is sown in the early fall 3 or 4 ounces will furnish a sufficient amount of greens for the family during the fall and early spring.

The whole of the spinach plant, not merely the leaves, is pulled when greens are desired. The larger plants are used first, and by this practice thinning becomes unnecessary. Always keep the rows free from weeds and cultivate frequently.

Varieties. Two varieties of spinach that have been successfully grown in many gardens are:

Dutch Savoy

Mustard. A plant that is frequently used for greens in place of spinach is *mustard* (Fig. 67). It grows in almost any garden soil and thrives best in a cool climate.

The seeds are planted ½ inch deep and about 5 seeds to the inch. Thin the plants to about 4 inches apart in the row. This crop can be planted in the early spring or late fall.

Either the entire plant or individual leaves may be pulled for greens. Mustard also makes a pungent salad as well as supplying greens for the table, and its seed is used for seasoning pickles, etc.

Varieties. Two varieties of mustard which have usually given satisfaction are:

Giant Ostrich Large-Leaved Curled

Courtesy of Livingston Seed Company

FIG. 67. *Mustard and kale grown for greens. Rows 1 and 4 are kale to be used for summer greens; rows 2 and 3 mustard for spring greens.*

STUDY OUTLINE

1. Name the two leading crops used as spring greens by American gardeners?
2. Describe the methods used in producing spinach?
3. What methods are used for mustard?
4. For what purpose other than greens is mustard used?

HOME AND COMMUNITY WORK

Visit the homes of five gardeners in your neighborhood.

1. How many have grown spring greens?
2. What crop has been most largely used for greens in the homes visited?

CHAPTER LII

SPRING SALADS

The spring salads that are most widely grown in American gardens are leaf lettuce, garden cress, and corn salad.

Leaf lettuce. The culture of lettuce has already been discussed (Chapter XXVII). This applies to leaf as well as head lettuce.

Garden cress. A crop that is easily grown and one that is excellent for flavoring salads and garnishing, or for sandwiches, is *garden cress* or *pepper grass*.

The seed should be sown very early in the spring about ½ inch deep, using 3 to 6 seeds to the inch in rows 12 inches apart. By sowing seed every ten days a continuous supply of cress will be provided.

This crop will be ready for use six weeks after planting, if it has been kept free from weeds and well cultivated. The entire plant is generally used for salad.

Corn salad. The plant commonly known as *corn salad* is also called *lamb's lettuce* and *fetticus*. This plant has never been very largely grown in America.

Sow the seed very early in the spring in rows 12 to 15 inches apart. Cultivate it as you would mustard and lettuce. For a very early spring crop corn salad seed may be planted in the fall and the plants covered lightly over winter for protection against the cold weather.

The plants should be thinned to 6 inches apart in the row to secure the best results. The crop should be ready for use in from six to eight weeks after planting.

Corn salad is frequently used alone like lettuce as a salad, or it may be served in combination with lettuce or garden cress.

STUDY OUTLINE

1. What crops are grown for spring salads?
2. What are the special uses of garden cress?
3. What culture does garden cress require?
4. By what other names is corn salad known?
5. What culture is required for corn salad?
6. How is corn salad prepared for the table?

HOME AND COMMUNITY WORK

1. What crops are grown for spring salads in the gardens of your community?
2. Which have proved most satisfactory for this purpose?

CHAPTER LIII

GREENS THAT ENDURE HEAT

Chard and Swiss chard, kale or borecole, collards, and New Zealand spinach, are the leading garden crops grown for summer greens by American gardeners. Kale has already been discussed in Chapter XLVIII and collards in Chapter XLIX.

Swiss chard. One of the most popular plants for greens is Swiss chard. It belongs to the beet family but is cultivated for its foliage instead of its root. Chard is prepared for the table like spinach. The tender stems are frequently cooked and served like asparagus.

The leaves may be cut without injury to the plant. Care should be used in removing them in order not to injure the crown. The gardener should have a sufficient number of plants to make it possible to remove only a few leaves at a time from each plant. In this way a continuous supply can be maintained.

If a very early crop of Swiss chard is desired, the plants may be started either in an indoor seed box or in a hotbed, and later set out in the garden.

The methods suggested for the planting and cultivation of the beet (Chapter XXXIII) may also be used for Swiss chard.

Varieties. The one variety of Swiss chard that is almost universally grown is:

Giant Lucullus

New Zealand spinach. The plant known as New Zealand spinach, unlike common spinach, withstands heat and dry weather and produces good greens during the summer months.

New Zealand spinach makes a much larger growth than true spinach, and should therefore be given more garden space. Rows should be 3 feet apart and plants thinned to stand 15 or 18 inches apart in the row. Seeds may be soaked two hours in warm water before planting, to assist germination. Plant seed ½ to 1 inch deep, using from 3 to 5 to the foot. The plants taken out when thinning, if not used for greens, may be transplanted to other garden space.

The fleshy young leaves and tender stems are prepared for the table like ordinary spinach.

STUDY OUTLINE

1. What methods of culture are required for kale?
2. What are required for collards?
3. How is Swiss chard grown?
4. Name one variety of Swiss chard.
5. What is the advantage of growing New Zealand spinach in the garden?

HOME AND COMMUNITY WORK

1. What summer crops are grown for greens in your community?
2. Which have proved most satisfactory?

CHAPTER LIV

SALADS THAT ENDURE HEAT

The chief plants grown for salads in hot weather are parsley, upland cress, and endive.

Parsley. America's leading plant for garnishing foods is parsley (Fig. 68). It is also used to flavor salads and soups.

Sow seeds in rows 12 inches apart and thin plants to stand 4 inches apart in the row. The seeds are very small and germinate slowly. For this reason the garden soil should be well prepared and the seed soaked in warm water before planting. The rows may be marked with radishes.

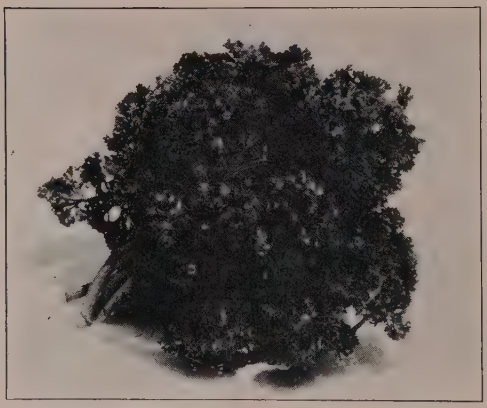


FIG. 68. *Parsley. Our most popular plant for garnishing.*

If an early crop is desired the seed may be sown in a hotbed and the plants transplanted to the garden as soon as the ground can be worked. The leaves will be large enough to use as a garnish about three months after planting.

This plant will withstand dry weather and continue growing until the ground freezes. If taken up in the fall and transplanted to indoor seed boxes or to cold frames the plants will continue to grow throughout the winter.

Varieties. The most desirable varieties for the home garden are:

Dwarf Moss Curled

Upland cress. Seed of upland cress may be sown in the early spring and will continue to provide leaves for salad all through the summer and fall. It does not produce seed the first year and in the North is killed in the winter unless well protected by mulching or moving to the cold frame, indoor seed box, or cellar.

The seeds are sown ½ inch deep in rows 12 inches apart. The plants should be thinned to stand 18 to 20 inches apart in the row.

The crop is ready for use in ten weeks after the seed is sown. When care is exercised in removing the leaves the plant will continue to produce new foliage and constantly furnish a fresh supply of salad material.

Endive. The endive is one of the finest of our salad plants. It is a native of China and was introduced into America from Europe. In the North it is planted in June or July. The seeds are sown in rows 18 inches apart and the plants thinned to stand 12 inches apart in the row.

If desired, seed may be sown in a seed bed and the plants transplanted later to the garden. If the weather is dry the plants will need watering out (Chapter XVIII). After they get started the plants may need watering during the dry, hot weather (Chapter XX). Cultivate the soil frequently and always as soon as possible after the plants have been watered.

Blanching. After the outer leaves of the plant are 8 inches long, draw them up and tie the ends together in order that the heart may blanch. This should be done at

a time when there is no moisture on the plant. The blanching process requires about three weeks. Only a few plants should be tied up at a time, for the hearts must be used as soon as they are well blanched; otherwise, they soon begin to decay.

When the gardener wishes to have salad material during the winter months he removes some of the late endive plants to a cellar or cold frame. These plants if cared for will furnish delightful salads for the winter.

Varieties. There are a number of varieties of endive. The varieties generally grown are:

White Curled Green Curled

STUDY OUTLINE

1. Name three garden salad plants that withstand the summer heat.
2. Give the methods of culture required for parsley.
3. Name two varieties of parsley.
4. Describe the culture required for upland cress.
5. What methods of planting and cultivating does endive require?

HOME AND COMMUNITY WORK

1. What summer salad plants are grown in your community?
2. Which ones have proved most satisfactory?

CHAPTER LV

PLANTS RELATED TO THE ONION

Chives, garlic, and leeks are well-known and widely used garden plants that are related to the onion.

Chives. The small onion-like plants (Fig. 69) called chives are used for flavoring soups. The part used is the hollow leaves. These may be cut off as desired, for new ones will quickly grow to take the place of those removed.

This plant is propagated by bulbs which form in clusters. The clusters are divided and planted early in the spring, 12 inches apart in rows 18 inches apart.

If leaves are desired for winter use transplant a few plants to indoor seed boxes, to the cellar or to a cold frame.

Garlic. Another plant used chiefly for flavoring foods is garlic. Some people, mostly those from southern Europe, serve garlic as a side dish like other vegetables. It has a very strong flavor.

Garlic is grown by planting out the small divisions of which the bulb is composed. These divisions are called "cloves." Each clove, as well as the entire mass of the cloves that make up the bulb, is surrounded by a thin membrane resembling the skin of an onion.

The culture required for garlic is the same as for the onion. The crop is harvested in the fall and cured for winter use by braiding the tops together and hanging up the bulbs in a dry, well-ventilated location.

Leeks. The leek is used in the same way as the onion for flavoring soups and stews. It is not so strong in

FIG. 69. *Chives. The grass-like leaves are hollow and grow in clusters.*

flavor, but it is coarser and tougher in texture. It requires the same general treatment as onions (Chapter XXX).

After the plants have fully developed, earth is drawn up around them to blanch the stems. Leeks do not form a bulb like the full-grown onion but instead have a stem that is uniformly thick throughout. The shape of the stem resembles that of the young green onion except that when properly grown it is much larger.

Leeks are marketed in bunches and stored for winter use like celery.

Varieties. The best variety of leek is the American Flag.

STUDY OUTLINE

1. Name three garden crops that are related to the onion.
2. What are the cultural requirements of chives, leeks, garlic?
3. For what purpose is each of the above crops used?

HOME AND COMMUNITY WORK

1. Are any of these crops grown in your neighborhood?
2. If so, which ones have proved most satisfactory?
3. How is each of them prepared for the table by your neighbors?

CHAPTER LVI

ROOT CROPS THAT WITHSTAND WINTER FREEZING

Parsnips, salsify, and horse-radish are root crops that withstand freezing as well as summer heat. Most people feel that these roots are improved by freezing. For this reason gardeners usually allow them to remain in the ground all winter and dig them early in the spring. For the winter supply, a few roots may be stored in an outdoor storage pit or an indoor cellar.

PARSNIPS AND SALSIFY

Parsnips. The culture for parsnips is the same as for carrots and has already been discussed on page 128.

FIG. 70. *Salsify or vegetable oyster plant. This plant is easily cultivated and very hardy.*

Salsify. The salsify (Fig. 70), or vegetable oyster as it is sometimes called, requires the same general treatment as parsnips and carrots.

An ounce of seed will be sufficient for 100 feet of row space. Plant seed ½ to 1 inch deep in rows 12 to 18 inches apart. Thin the plants to stand 3 or 4 inches apart. The growth of this crop requires 120 to 180 days.

Salsify is a biennial, and for this reason the roots should be dug before the second season to prevent the plant going to seed. Salsify is served in the same way as the parsnip. The plant has an oyster flavor and because of this it is known as "vegetable oyster."

Varieties. The varieties of salsify that are most generally cultivated are:

Sandwich Island
Long White
Mammoth

HORSE RADISH

Soil and culture. Horse-radish requires a deep, rich, well-drained soil. The roots are planted in rows 3 feet apart and the plants 12 to 18 inches apart in the row. Root cuttings are used for planting. These cuttings are obtained by taking the small side roots from the main roots as the gardener does when preparing the crop for market. Select roots that are 6 inches long and ¼ to ½ inch in diameter. If kept free from weeds and well cultivated, a dozen hills will produce enough roots for the ordinary family.

Horse-radish is usually planted at one end of the garden near other perennials such as asparagus and rhubarb.

The roots are prepared for use by peeling and grating. The grated root stands in salt and vinegar for a short time and then is ready to be served with meats as a condiment. Roots intended for table use should be dug in the winter or early spring before the leaves begin to grow.

STUDY OUTLINE

1. What root crops withstand winter freezing as well as summer heat?
2. What culture do parsnips require?
3. How is salsify produced?
4. By what other name is it sometimes called? Why?
5. What culture is required for horse-radish?
6. What use is made of horse-radish by the family?

HOME AND COMMUNITY WORK

1. Are any root crops that withstand winter freezing, as well as summer heat, grown in your community? If so, name them.
2. Which ones have proved the most popular in your neighborhood?

CHAPTER LVII

PERENNIAL CROPS

The most important perennial crops grown in American gardens are asparagus, rhubarb, and horse-radish. Asparagus and rhubarb should be found in every home garden. It requires a few years for them to reach their best development. They are not difficult to raise but to grow them successfully requires patience. Try a few roots of asparagus and rhubarb at one end of the garden. The results will usually justify the effort and the small expense involved.

Horse-radish has already been treated under Root Crops that Withstand Winter Freezing, page 192.

ASPARAGUS

Soil. Almost any well-drained soil that has been fertilized with good stable manure is suitable for asparagus and will yield good crops. It can be grown from seeds but time is saved by purchasing two-year-old roots from a reliable dealer. These roots may be transplanted to the garden late in the fall or early in the spring.

After choosing the location for your asparagus, remove 5 inches of the top soil. With a pick, shovel, or spade, dig up the subsoil to a depth of 14 or 18 inches. Into this loose soil mix well-rotted stable manure. Then replace the top soil, thoroughly mixing fertilizer with it.

Planting and cultivation. In a large garden where horse-drawn implements are to be used, plant the roots in rows 4 feet apart and 15 inches apart in the row.

If your garden is less than ⅛ of an acre, plant the roots in beds at one end of the garden. Place them 12 to 15 inches apart in rows 12 inches apart and cultivate by hand. Plant the root crowns 4 or 5 inches deep. In the North mulch during cold weather with 3 inches of stable manure. Remove this mulch gradually so that as the weather grows warmer in the spring, the ground may be warmed by the sun's heat.

FIG. 71. *Asparagus bunched for market. Asparagus is hardy, early, and a sure crop.*

Cutting. No shoots should be cut the first year and only a few the second. But if the bed is kept well fertilized after the second year, it will be permanent and will furnish a good supply of tender shoots each season.

During the cutting season be sure to keep all shoots removed, as the roots will cease producing when shoots are permitted to mature. After the season for cutting is over, the shoots should be permitted to grow and form large tops. In the late fall remove all tops and give the bed another supply of rich stable manure.

RHUBARB

Soil and climate. All that has been said about soil and fertilizers required for asparagus applies equally to rhubarb.

It does best in gardens where it is cool, and is perfectly hardy in localities where the climate is severe.

Planting and cultivation. A dozen hills planted at one end of the garden will be sufficient for an ordinary family.

FIG. 72. *A bunch of rhubarb stalks.*

Time is saved by planting pieces of roots from an old bed rather than by using seed. These pieces or parts of roots from old hills of rhubarb should be planted 4 feet apart in rows 3 feet apart. Be careful to see that each root has at least one good bud. The plants succeed best if set out in the fall.

The thick leaf stems are used after the second year. The chief use of rhubarb as a food is for pies and sauces.

The seed stalks should be kept cut in order that young shoots may continue to come up and be available for a longer period.

Mulch this plant for winter as you do asparagus.

Fresh young stalks can be obtained in winter from rhubarb roots that have been transplanted to a cold frame

or indoor cellar and kept moist and warm. This process, known as forcing the roots, produces tender fine-flavored stalks. Two or three year old plants should be used for forcing. No stalks should be pulled from these roots during the summer.

STUDY OUTLINE

1. Name three popular perennial crops that may be found in American gardens.
2. Describe the culture required for asparagus.
3. Describe the culture of rhubarb.

HOME AND COMMUNITY WORK

Visit four gardens in the neighborhood and be prepared to answer the following questions:

1. How long have the rhubarb and asparagus beds been producing?
2. How are they protected over winter?
3. What soils produce the best asparagus or rhubarb?
4. What fertilizers are used to keep the soil in the beds rich?

CHAPTER LVIII

SAVING SEED FOR PLANTING

Each year it is becoming more and more difficult to secure good garden seed. In view of this fact, the gardener should produce at least a part of his own seed. In planning the garden, space can be saved for the growing of special seed plants. If preferred, the healthiest and best developed plants in the regular garden space may be permitted to go to seed.

If different varieties of a crop, which mature at the same time, are planted in the same part of the garden they are liable to become mixed. Vine crops and sweet corn are good examples of such crops. This mixing causes the seed to become impure and is the result of the pollen grains from the tassels (stamens) of one variety falling upon the silk (pistils) of another variety that is at about the same stage of maturity. No mixed or impure seed should be saved for planting.

Garden crops may be divided into three groups: (1) annuals; (2) biennials; (3) perennials.

Annuals. The annuals live for one year and ripen their seed. Peas, beans, spinach, corn, squash, cucumbers, tomatoes, lettuce, and radishes are good examples of this group.

Biennials. The biennials ripen their seeds the second year and then die. This group includes carrots, beets, cabbages, onions, parsnips, and turnips. As the biennials do not mature the first year, that is, flower and produce seed, it

follows that they must be allowed to stay in the garden two years. However, roots or plants from biennials that have been stored may be taken out of storage and planted when the soil has become warm, and they will grow, mature, and produce seed the same year.

Perennials. The tops of perennials usually die in winter, but the roots or root stalks live on year after year. While some of the perennials may be grown from seed, it is better to propagate from "piece" roots. These may be purchased or grown in the garden. By using roots time is gained and the plants come true to variety. This is true, as we have already learned, of the most important garden perennials, rhubarb, asparagus, and horse-radish.

Harvesting and cleaning seed. Gather seeds that are ripe before there is danger of frost. They should be gathered from plants that are healthy, vigorous, true to type, and have produced satisfactorily. Spread the seeds out to dry in a well-ventilated, sheltered place.

Cucumbers, melons, tomatoes, and similar plants should be gathered before there is danger from frost. The seeds should be removed and washed free from the pulp matter. They should then be dried in a sheltered place. Seeds such as lettuce and radish may be whipped out on a piece of cloth or paper, or rolled out by hand.

Protecting the seed. After the plants have been whipped to remove the seeds the chaff can be taken out by the wind. This is done by pouring them from one receptacle into another on a windy day. This process will also remove many small and inferior seeds.

Before storing, seeds should be carefully selected and all inferior specimens removed. Proper storing and handling

has much to do with the vitality of seeds. All seed saved should be correctly labeled and put in containers that will protect them from mice or other destructive agents.

Potatoes that are to be used for seed should be placed in the cellar in a well-ventilated receptacle. Read carefully the instructions for storing potatoes and also for storing other garden crops (Chapters LXXV–LXXIX).

Well-matured ears of seed corn can be tied together and suspended from nails or hooks in a well-ventilated dry location.

STUDY OUTLINE

1. Into what three groups are garden crops divided?
2. What are annuals? Name five.
3. What are biennials? Name five.
4. What are perennials? Name three.
5. Should the gardener save part or all of his seed? If so from what kind of plants should it be saved?

HOME AND COMMUNITY WORK

1. Name six garden crops that are grown in the home gardens of your neighborhood.
2. Classify these as annuals, biennials, and perennials.
3. What methods, if any, are used in your community for producing and saving seed to plant in the home gardens?

CHAPTER LIX

HARVESTING VEGETABLE CROPS

The importance of properly harvesting garden crops cannot be overestimated. There is great loss each year in the United States because of neglect in harvesting and the use of wrong methods.

Harvesting stem crops. *Asparagus* is cut close to the ground when the shoots are 4 to 6 inches tall. The shoots are then sorted and bundled and the butts cut off even.

Rhubarb should be used while young. Cut the stems close to the ground but do not disturb the crowns. By keeping the seed stalks cut back more stems will grow.

Celery should be cut just beneath the crown when it is sufficiently developed.

Early *potatoes* should be harvested as soon as they are large enough for the table, and late ones as soon as the vines have died.

Early *sweet potatoes* are dug as soon as they are large enough to use as food, but late ones should be left in the ground as late as possible before killing frosts.

Leaf crops. Lettuce, spinach, mustard, and young kale are all cut off just beneath the crowns. This should be done in the morning when the leaves are filled with moisture. The outer leaves of Swiss chard and fall kale are cut from the plants when they are 5 to 10 inches long. This should also be done in the morning. Cabbages and cauliflower should be used while young. They begin to get tough after

reaching about three fourths of their mature size. Cut off the heads just beneath the crowns.

Root crops. We should begin using radishes, carrots, turnips, and beets when they have reached about half their full development. Radishes grow pithy and hot soon after reaching maturity. Root crops mature irregularly. Pull the largest vegetables first.

Vine crops. String *beans* should be picked when the pods are good sized, snap readily, and have soft pliable tips. Do not let the pods get tough and stringy nor wait until the seeds are well formed. The pods of shell beans should be left on the vines until they mature but not until they dry out and crack open. When lima beans are to be used green, they should be picked when the beans are full grown in the pods but before they become dry and hard.

Peas should be picked as soon as they are three-fourths their full size in the pod. They toughen soon after reaching maturity.

Cucumbers should be picked before the seeds begin to develop. After the seeds are formed production decreases. When cucumbers are to be sold or used for pickles they should be picked as soon as they reach the desired size.

Summer squashes are picked as soon as large enough and while the skin will give to the press of the finger. *Winter squashes* may be left until the other harvesting is done. A slight frost will not harm them but they should be gathered before a hard freeze.

Melons are generally ready when they crack around the stem. Watermelons are usually ripe when the tendril near the stem is dry. A peculiar mellow response, or a "dead" sound when thumped, also indicates a ripe watermelon.

Tomatoes should be gathered as fast as they ripen. If a frost threatens, pick green tomatoes, wrap each one in paper separately, and put them in a dry place. Unwrap a few at a time and place them in the sun to ripen. If pre-

FIG. 73. *Harvest day at a school for the blind, Cleveland. These young pupils, encouraged and directed by their instructors, in spite of their handicap have proved to be successful gardeners.*

ferred pull up the vines and put them in a dry place in order that the tomatoes may ripen.

Corn. When corn is in the "milk" it is ready for use. When sweet corn is ready for the table a few of the silks

begin turning brown. Use sweet corn as soon as pulled. Corn pulled and kept over night loses at least 50 per cent of its normal quality.

Peppers. Pick sweet peppers while green, and hot peppers after the skins have turned red. The stem should always be left attached.

Onions. Onions are ripe and ready to be harvested when the tops have fallen and the outer skins are dry.

STUDY OUTLINE

1. Name five general classes of crops.
2. How or when are stem crops harvested?
3. How or when are leaf crops harvested?
4. How or when are root crops harvested?
5. How or when are vine crops harvested?
6. How or when is corn harvested?
7. How or when are peppers harvested?
8. When are onions ripe?

HOME AND COMMUNITY WORK

Visit the homes of five gardeners and learn the answers to the following:

1. How or when are stem crops harvested?
2. How or when are leaf crops harvested?
3. How or when are root crops harvested?
4. How or when are vine crops harvested?
5. How or when are corn, peppers, and onions harvested?

CHAPTER LX

MARKETING VEGETABLE CROPS

Each year our gardeners experience great loss from improper marketing. Far too little attention has been given to this important part of the gardener's work. The gardeners of the future must profit by the mistakes that have been made in the past. More attention must be given to the preparation for market, the display of vegetables, and the different types of marketing. Special efforts should be made by gardeners to work out plans for coöperative marketing.

Preparing vegetables for market. Vegetables should not be marketed directly from the garden. They should receive

FIG. 74. *A home market on the highway. A passer-by has stopped to purchase some vegetables from the young gardeners.*

such special treatment as washing, trimming, grading, sorting, and must be free from defects. Care should be taken

FIG. 75. *A co-operative school market, Richmond, Indiana. Here young gardeners are being taught that quality and suitable arrangement are important factors in selling their products.*

to have them always in the very best state when placed upon the market.

Vegetables to be attractive must not only be clean but they must be also fresh and crisp. When sorting and grading for the market give attention to quality as well as to form and size. Grade them so that the selling price asked will correspond with the grades established.

Types of marketing. There are several established types of marketing vegetables and small fruits. Among those of special interest to young gardeners are community, individual (Fig. 74), and coöperative marketing.

The *community* type can be located at the school, in some attractive central location, or in the municipal market. Some *individual* types that may be mentioned are the market at home, selling vegetables to neighbors from the wagon, or shipping by parcel post.

There are *coöperative* types which provide for coöperation with others who sell at central locations in the city, county, or special markets (Figs. 75 and 76).

How to display vegetables. Arrange the display so that it will present a neat appearance. Place vegetables of similar type together. For example, the root or vine crops

FIG. 76. *The Richmond school market, with the exhibits all in place, is here seen open and ready for business.*

should be grouped in a regular section in the market and not be scattered throughout the entire market space. For

a brief classification of crops into kinds and types see Chapter LIX.

Use substantial yet inexpensive containers. The exhibit will make a better appearance if these are as nearly uniform in size as your various crops will permit.

Stem crops. Asparagus and rhubarb are sold in bunches while the stems are young and tender. The same plan is usually followed with celery. Early potatoes are sold by measure or weight as soon as they become large enough. They should be graded according to size.

Leaf crops. The leaf crops should be picked early in the morning while crisp. They should be washed in cold water, bunched, and kept in a cool place until ready to display in the market.

Root crops. Wash all root crops in cold water immediately after pulling. Arrange in bunches and wash again. The bunches will vary in size according to the demand. Green onions are skinned and the roots cut off. Leeks are skinned but the roots are not removed. Custom varies in different localities. In some markets it is not customary to cut off the tops of root crops.

Vine crops. Pick all crops carefully and place in clean containers. Wipe tomatoes with a damp cloth, placing those of the same size, shape, and color in the same container. Peas and early beans are generally sold in the pod, while lima beans are usually hulled and sold by the quart. Cucumbers are sold by the measure or the dozen. Melons, squashes, and pumpkins are sold individually or by the dozen.

Sweet corn. This crop is marketed with husks on and sold almost universally by the dozen.

STUDY OUTLINE

1. What things should be observed in preparing crops for market?
2. How should the vegetable display be arranged?
3. Name three different ways of marketing crops.
4. Describe each.
5. How are vegetables under each of the five classes of crops marketed?

HOME AND COMMUNITY WORK

Visit a vegetable market in your neighborhood and prepare answers to the following:

1. How were the vegetables arranged in the market?
2. What ways of marketing are followed in your locality?
3. In your opinion what improvements could be made in the marketing methods of your community?

CHAPTER LXI

SMALL FRUITS

The fruits considered in this chapter include the strawberry, blackberry, raspberry, currant, and gooseberry.

Soil and soil conditions. Small fruits do best when planted where other garden crops have already been grown rather than in new soil just broken out of sod. Corn or potatoes grown on soil that has been well treated with stable fertilizer before planting make good crops to precede small fruits. Soil in which small fruits are planted should be covered with good stable manure. It should be free from weeds and grasses, must contain no insect larvae that would injure the crops, and should be in a high state of cultivation. Many gardeners make a mistake in not giving proper preparation to soil intended for small fruits.

Mulching. When small fruits are planted in the fall in regions where the ground freezes to a considerable depth during the winter, the newly set plants should be well mulched to prevent winter killing. Cornstalks, leaves, and straw are materials that are most frequently used for mulching. Perhaps on the whole it will be safer to set out the plants in the spring, especially for the inexperienced gardener.

Planting and cultivation. Small fruits should be planted in rows so that they can be more successfully cultivated. Care should be taken to avoid overcrowding plants in the rows. Fruit of proper size and quality cannot be produced unless the plants have sufficient food, air, and sunshine.

Before setting out plants be sure that all broken or decayed roots, branches, or leaves have been removed. Plants that are diseased or infested with injurious insects should be destroyed.

Small fruits should be cultivated soon after planting and at frequent intervals during the following summer and fall.

STUDY OUTLINE

1. What crops are good to precede small fruits?
2. What four points should receive consideration in the preparation of soil for small fruits?
3. What materials are commonly used for mulching small-fruit crops during the cold season?
4. Why should overcrowding the plants in the rows be avoided?

HOME AND COMMUNITY WORK

1. What small-fruit crops are grown in your neighborhood?
2. What plans are used to protect the plants over winter?

CHAPTER LXII

STRAWBERRIES

Planting and cultivation. Strawberries (Fig. 77) are grown in many different kinds of soil but do best in a moist, sandy loam. They may be planted in the early spring or late summer.

The plants should be set 15 to 24 inches apart in rows 4 to 5 feet apart. Be sure to pack the soil about the roots, and be very careful not to get any of it in the crown. When plants are set out in the spring the blossoms are usually removed to encourage plant growth. Runners are permitted to root early in the season and to continue until a row width of 15 to 18 inches is attained. Runners formed beyond this distance and late in the season are usually cut off. The plants should not be permitted to fruit the first year.

Strawberries should have a sunny situation in the garden and should be cultivated frequently until blossoming time. After that is over, cultivation should be discontinued. Some successful growers cover the ground with straw until after the fruit is harvested. This tends to keep the fruit clean and serves as a mulch.

During the fall cover the plants with straw containing some stable manure. When spring comes rake the coarse material between the rows and spade in all manure and fine material.

Use Bordeaux mixture to prevent plant diseases. Directions for preparing it will be found on page 136.

Perfect and imperfect flowers. Some plants bear what are called perfect flowers, that is, blossoms possessing both

FIG. 77. *A flourishing strawberry patch and a sample of the fruit being marketed from it.*

stamens and pistils. Such flowers are said to have both male and female organs, and the plants that bear them are self-fertilizing. Other plants bear only imperfect flowers, those that have pistils, female organs, but no stamens, and are known as pistillate. Pistillate plants are unproductive when planted alone. Therefore, where there are pistillate plants in the patch, those bearing perfect flowers that bloom at the same time must also be grown every 6 to 8 feet in the row in order to pollenize the imperfect or pistillate flowers so that they will produce fruit.

Varieties. Strawberries that are popular throughout a large part of the country are:

STANDARD (PERFECT FLOWERS)	STANDARD (IMPERFECT FLOWERS)	EVERBEARING (PERFECT FLOWERS)
Dr. Burrill	Crescent	Progressive
Lady Thompson	Warfield	Superb
Sentor Dunlap		
Tennessee		

STUDY OUTLINE

1. What kind of soil is most suitable for growing strawberries?
2. Describe the methods used in planting and caring for this crop.
3. Why are the flowers of some strawberry plants called "perfect" and others "imperfect"?
4. Name five varieties of strawberries. Which, if any, have imperfect flowers?

HOME AND COMMUNITY WORK

1. What varieties of strawberries have proved most satisfactory in your community?

CHAPTER LXIII

BLACKBERRIES AND RASPBERRIES

BLACKBERRIES

Soil and climate. The blackberry will thrive in a lighter and drier soil than the strawberry, but frequent rains during the summer will produce a better crop of berries.

Planting and care. This crop may be planted early in the spring or in the fall. New plants, known as suckers, are procured from newly established fields or from root cuttings. Plants should be set 4 feet apart in rows 5 to 6 feet apart. Plant them 3 or 4 inches deep and cut back the tops to from 3 to 5 inches in length. Blackberries will grow in partially shaded locations.

When the bushes get well established cut out all old wood late in the fall or before the new growth begins in the spring. Do not permit canes to grow more than 4 to 5 feet high. Remove all diseased canes as soon as noticed.

Mulching as suggested for strawberries should prove beneficial.

Varieties. Good varieties of blackberries that have been successfully grown are:

EARLY	LATE
Early King	Success
Eldorado	Taylor

RASPBERRIES

There are three types of raspberries — the red, black, and purple. Some gardeners also recognize a yellow type.

Red. The red varieties will flourish in more kinds of soil than the black. Raspberries do best in rich, well-drained clay loam. Pruning is commonly limited to cutting back the canes to one-third of their growth and should be done in spring before the leaves start. Remove all old canes.

Black. In many sections black raspberries are less popular than red for eating fresh, but are more generally used for canning or drying. The plants are obtained from rooted tips. These should be planted like the red kinds. When the canes reach a height of 18 to 24 inches they should be trimmed back. Tips not desired for sale or new plantings should not be allowed to root. Early in the spring remove all old canes and cut back branches to 15 inches.

Purple. The purple varieties have never become so well known and are not so highly appreciated as the other kinds. The care of these is the same as for black raspberries.

Varieties. Some good varieties that are commonly grown of each type of raspberry are:

RED	BLACK	PURPLE	YELLOW
Cuthbert	Ohio	Shaffer	Golden Queen
King	Gregg	Columbian	
Miller	Cumberland		
Thompson	Kansas		

STUDY OUTLINE

1. Describe the method of planting and cultivating blackberries.
2. Name two early and two late varieties.
3. Describe the method of planting and cultivating raspberries.
4. Name two varieties of each raspberry type.

HOME AND COMMUNITY WORK

1. What varieties of blackberries and raspberries have proved most satisfactory in your community?

CHAPTER LXIV

CURRANTS AND GOOSEBERRIES

Soil and cultivation. Currants and gooseberries require about the same kind of soil and treatment for successful growth. These crops do best in a moist, clayey or sandy loam. Almost any back yard or garden will afford a suitable location. They are cool-climate plants and if planted south of the Ohio River it will be best to provide a partial shade.

Plants should be set 3 feet apart in rows 5 or 6 feet apart. While these bush fruits require little work, careful cultivation will increase the yield and improve the quality of the fruit. A liberal supply of stable manure should be used to secure the best results.

Plants two years old, having good roots grown from cuttings, should be used. It is customary to set them out in the fall, but they can be successfully transplanted in the spring.

Pruning. Prune in the fall or early in the spring. Remove weak branches and all those over three years old. The best fruit is produced on one-year-old shoots. From 3 to 5 stems to the bush is advisable. The stems should be kept renewed by cutting back.

Mulching. When the season becomes hot and dry a mulch of straw and manure should be used between the plants and rows.

Insects. Spraying with Paris green or arsenate of lead will destroy the currant worm.

Varieties. The most widely known varieties of the different kinds of currants and gooseberries are:

RED CURRANTS	WHITE CURRANTS	BLACK CURRANTS
Cherry	White Grape	Black
Prince Albert	White Dutch	Naples
Victoria		
Red Dutch		

AMERICAN GOOSEBERRIES	ENGLISH GOOSEBERRIES
Houghton	Industry
Downing	Triumph

STUDY OUTLINE

1. What methods are used for the planting and cultivation of the currant and gooseberry?
2. How can the currant worm be destroyed?
3. Name two varieties of each of the red, white, and black kinds of currants.
4. Name two varieties of each of the American and English type of gooseberries.

HOME AND COMMUNITY WORK

1. What varieties of currants and gooseberries are most generally grown in your neighborhood?
2. Which ones are most satisfactory?

CHAPTER LXV

GRAPES

Propagating grape vines. Grape vines may be propagated from seed, from cuttings, or by layering or grafting. The first method is used only when new varieties are to be grown. Seedlings, vines produced from seeds, differ so widely that they are seldom used even for grafting.

Cuttings for propagating may be prepared at any time after the vines have become dormant.

All varieties of grapes may be propagated by layers. When this method is used select canes of the last season's growth, preferably those that start near the base of the vine.

There are two advantages in grafting: (1) Changing poor varieties to valuable ones; (2) protecting non-resistant varieties from disease by grafting them upon strong stocks.

Grapes are grown in all parts of the world. This crop can be produced on almost any kind of soil providing it is given a reasonable amount of cultivation and fertilizing.

Pruning grape vines. The pruning of grape vines requires careful study if the best results are to be attained. Grapes are borne on new wood and these new shoots spring from buds on wood of the previous year's growth.

Grape vines should be trimmed early in the spring before the sap begins to run. The first spring after a new vine has grown through one season, cut away all but one stem and cut this one stem back so as to leave only one or two buds. The second spring cut away all but two branches of the main stem and if these are long cut

them back; laterals will grow out and bear fruit from these two branches. The third spring cut away all but four of the shoots nearest the main stem and cut these back so that they will not have more than ten buds. To produce the best results continue to thin out the vines each year.

Vines should be kept off the ground by means of a support. For details on training grape vines as well as pruning and propagating consult *Farmers' Bulletin 471*.

Diseases. To prevent plant diseases among grape vines clean up and burn all the dead branches and leaves early in the spring. After the buds begin to swell spray with Bordeaux mixture (Chapter XXXVII) every ten days until the fruit is set. If leaf blight develops spray every two weeks after the crop is harvested.

Varieties: Many different varieties of grapes have been grown in different shades of greenish white, red and purple. Among some of the more important are:

BLACK	RED OR AMBER	WHITE
Champion	Agawam	Diamond
Concord	Catawba	Niagara
Moore's Early	Delaware	Winchell
Worden	Wyoming	

STUDY OUTLINE

1. How are grape vines propagated?
2. What are two advantages of propagating them by grafting?
3. Describe pruning a grape vine from the first to the third year.
4. How should the vines be trained? How are diseases prevented?
5. Name four varieties of grapes.

HOME AND COMMUNITY WORK

1. What varieties of grapes grown in your community are most satisfactory?

CHAPTER LXVI

HARVESTING AND MARKETING SMALL FRUITS

When selecting varieties of small fruits for planting, gardeners should consider market demands, the character of the fruit as to firmness, that is, whether or not it will stand shipment, as well as the other things mentioned in table 2 of Chapter VII on small fruits.

Choosing varieties for planting. The main planting should consist of standard varieties that have proved to be successful. New kinds should be planted only in a limited way at first until their value has been proved. Plant two varieties of each kind of fruit except strawberries. Three or four different varieties of this fruit ripening in succession will distribute the labor over a longer period of time and prevent overstocking the supply needed in the home or market.

When a demand arises for some special kind of fruit because of certain qualities it possesses, the gardener should devote more time to its production in order to meet the needs of the market.

Packing the fruit. When any of the small fruits are grown in sufficient quantity to market, the following things should be considered: (1) The size of the fruit containers as determined by custom, law, or market requirements; (2) the construction of the containers, that they may be as light as is consistent with strength and stiffness; (3) the neatness and cleanliness of the packages. The quart box is used in marketing most small fruits. An exception is usually made in the

case of red raspberries which are put up in pint cups or boxes, and sometimes with currants that are frequently sold in the climax basket. When the fruits are to be marketed in pint or quart boxes these small containers are packed in a crate.

It is important that no decayed, unripe, or imperfect berries should be placed in the containers with fruit intended either for home use or for the market. Such fruit will not only prevent the owner from securing a reasonable price for his product but will also cause the rapid decay of the perfect fruit.

If the grower desires to build up a trade all berries should be as nearly uniform in size and quality as possible, and must be clean.

Gathering the crop. In picking strawberries a short piece of stem should be left on each berry. If berries are slipped from the stem their keeping and shipping qualities are injured.

Hand picking is the most satisfactory method for removing small fruits from vines or bushes. They should be placed, not dropped, into the basket or cup, for careless handling results in bruising the fruit. Bruised fruit will soon decay and become worthless.

The proper time for picking depends on the distance the fruit is to be shipped. If the fruit is to be used at home or sold in local markets it should be left on the bushes or vines until thoroughly ripened; but if it is to be shipped any great distance it must be packed when firm and not too ripe. It is for this reason that fruit purchased near where it is produced usually is of better quality than that shipped from a distance. The gardener who grows his own small fruit and

cares for it in the proper way will always have a better quality than if it were grown in a locality a considerable distance from his home.

STUDY OUTLINE

1. What important things should the gardener consider in selecting varieties of small fruits?
2. What three points should be taken into consideration when marketing small fruits?
3. What care should be taken in picking small fruit?

HOME AND COMMUNITY WORK

1. What small fruits are produced for the market in your locality?
2. What varieties of each kind of fruit are most popular in your local markets?

CHAPTER LXVII

USEFUL PLANTS USED FOR ORNAMENT

The *Scarlet Runner bean* may be planted so that it will climb fences or the porches about the house. In America it is better known as a flower than a vegetable, but in Europe it is cultivated extensively as a food plant.

The *sugar pea*, or edible-pod pea, which when used as a food is prepared and served like string beans, has a blossom as beautiful as the sweet pea.

The *variegated kale* is often used as an ornamental plant.

Carrots, because of their attractive foliage, are frequently grown along walks or paths in the garden.

Parsley, in addition to its value for garnishing, is frequently planted as a border for beds or walks in the yard or garden.

Okra has a beautiful flower, besides being much prized as a vegetable.

The *martynia*, the pods of which make an excellent substitute for cucumber pickles, has a beautiful flower.

Pumpkins or *squashes* are excellent plants to use for concealing rough places in the yard or garden. The vines can also be trained to run on fences or walls.

Grape vines will cover fences or serve as screens for unsightly places besides affording an effective background for other plants.

Quince bushes can be planted instead of lilacs. The blossom is ornamental and the fruit is of great value to the family when made into preserves.

Sunflowers may be used along fences or to serve as a screen. Their seeds are valuable as food for poultry. Sunflowers are also grown as supports for climbing beans.

The *Witloof chicory* has a beautiful blue flower and possesses some value as a food plant. The leaves are used for

FIG. 78. *Pole lima beans. Here this useful garden vegetable furnishes a luxuriant screen for the back yard fence.*

salad as well as for greens. The roots are used as an adulterant of coffee.

The *Jerusalem artichoke* has an attractive yellow blossom similar to that of the native sunflower. It is used for food in some parts of the United States, perhaps most frequently for salads and pickles.

The *castor bean* is used for screening unsightly objects from view. The castor plant is cultivated in fields for the

beans, which yield a valuable medicinal oil, the castor oil of commerce.

Pole lima beans are frequently planted so that their vines may serve as screens for porches, buildings, or the garden fence (Fig. 78).

Tomatoes of the tall varieties, if carefully pruned to one stem and staked up, will serve as a screen for fences or unsightly places.

Such plants as those discussed in this chapter are being used more and more for decorative purposes, replacing to some extent the merely ornamental flowering plants. The reason for this is the great demand for food. This is not merely a temporary demand but will increase as our population increases. For this reason every one should know more about the ornamental plants that can be used as food.

STUDY OUTLINE

1. Name ten useful plants that are grown for ornamental purposes.
2. How is each of these plants used as a food?

HOME AND COMMUNITY WORK

1. Are there any food plants grown in your community for ornamental purposes?
2. If so, name and describe them.
3. How is each used as a food?

CHAPTER LXVIII

PLANTS TO BEAUTIFY THE YARD OR GARDEN

The appearance of a yard or garden (Fig. 79) is greatly improved by the presence of flowers and shrubbery. Some well-known varieties are suggested in this chapter as a help to the gardener in making desirable selections for his grounds. Vines and window boxes add much to the attractive appearance of the home (Fig. 81).

FIG. 79. *A flower-bordered vegetable garden. Ornamental plants add much beauty and interest to a well-kept garden.*

Bulbs. Popular hardy flowering bulbs for fall planting are hyacinths, tulips, narcissi, and lilies; for spring planting, cannas, dahlias, gladioli, tuberoses, and the caladiums.

FIG. 80. *A moon vine. This ornamental plant affords an excellent covering for the garden fence.*

Vines. The white *moonflower* is a vigorous vine that will make a growth of 50 feet in one season. It has large, funnel-shaped flowers and abundant foliage. This vine is very suitable for screening porches and fences (Fig. 80).

The *matrimony vine* is largely used for covering unsightly buildings or fences and for furnishing shade for porches.

The *Boston ivy* may be used where a covering for brick or stone walls is desired or for purely ornamental purposes on fences or on a trellis.

The Virginia creeper, honeysuckle, trumpet flower, false bitter sweet, and several kinds of clematis are also popular vines in many sections of the country.

Plants for ground covering. Trailing myrtle or vinca, snow-in-summer, moneywort, and moss pink are used for ground coverings.

Perennials. Among our most popular perennials which may be recommended as desirable for any flower garden

FIG. 81. *Starting ornamental plants in egg shells in a window garden. Notice the climbing vines and the luxuriant plants and vines in the window box.*

are peonies, phlox, pinks, golden glow, coneflower, and larkspur. The following classification may help the young

gardener in making a selection of perennials that will be most suited to his particular purposes.

Perennials for cut flowers: Columbine, forget-me-not, phlox, delphinium, peonies, chrysanthemums.

Perennials that succeed best in sunny places: Sweet William, foxglove, phlox, coneflower.

Perennials that flourish in shady places: Forget-me-not, hardy pansies, columbine, lily-of-the-valley.

White-flowering perennials: Funkia or day lily, snow-in-summer, Shasta daisy, yucca.

Yellow-flowering perennials: Golden glow, gold flower, columbine, helianthus, chrysanthemums.

Pink-flowering perennials: Garden pinks, hardy hibiscus or rosemallow, hollyhocks, peonies, dicentra (bleeding heart).

Red-flowering perennials: Cardinal flower, beard's tongue, anemone japonica, peonies, oriental poppy.

Blue-flowering perennials: Phlox, columbine, delphinium or larkspur, hardy sage, Japan iris.

Shrubs. When carefully arranged, shrubs have a distinctly decorative value in yard, garden, or lawn. They may be grouped as follows:

Shrubs for cut flowers: Lilac, spirea, hydrangea, syringa, snowball, weigelia.

Shrubs attractive for their fruit: Japanese barberry, snowberry, strawberry tree, high-bush cranberry, wahoo, viburnum.

Drouth-resisting shrubs: Russian olive, Siberian pea tree, St. John's wort, sand cherry.

Shrubs suited to cold climates: Lilac, snowball, bush honeysuckle, Juneberry.

Shrubs that like sunny situations: Blue spirea, Carolina alspice, oleaster.

Shrubs for shady places: St. John's wort, snowberry, red bud or Judas tree, red-stemmed dogwood.

White-flowering shrubs: Siberian dogwood, silverbell, pepperbush.

Yellow-flowering shrubs: Golden bell, golden currant, St. John's wort, forsythia.

Red-flowering shrubs: Althea, red bud, currant red flower, japonica or Japanese quince.

Pink-flowering shrubs: Weigelia, flowering almond, flowering crab.

STUDY OUTLINE

1. Name some bulbs suitable for fall planting.
2. Name some bulbs suitable for spring planting.
3. Name three vines widely used for ornamental purposes.
4. Name two perennials used for each of the following purposes: cut flowers, planting in sunny places, and planting in shady places.
5. Name two perennials with white flowers, two with yellow, two with pink, and two with red.
6. Suggest two kinds of shrubs used for each of the following purposes: cut flowers, attractive fruit, to resist drought, to plant in cold climates, to plant in sunny places, and to plant in shady places.

CHAPTER LXIX

FALL WORK FOR THE SPRING GARDEN

The successful gardener has come to realize that gardening is an all-year-round occupation, and that time and money expended in the fall insure a better spring and summer garden. One of the chief reasons for fall garden work is that insects that are troublesome to crops in the spring and summer are sheltered in an early stage of their lives during the winter by weeds and garden refuse. Many gardeners either do not know this fact about the habits of insects or utterly disregard it.

Why garden trash should be burned in the fall. Many injurious insects hibernate in the garden trash, and for this reason all such material should be raked up in the fall and burned. Cleaning the fall garden will destroy many insects that would otherwise injure the spring and summer garden.

Fall plowing and spading. Fall plowing will help put the soil in better condition for spring working. It will also aid in destroying insects. After spading or plowing, the soil should be left rough, that is, not harrowed or raked. This rough surface will permit the air and rain to penetrate the soil. The moisture in the soil, especially in the North, later will freeze and thaw and the freezing and thawing will help make the soil mellow.

Fertilizing. Many gardeners scatter fresh stable manure over the newly plowed soil. The fall and early spring rains will dissolve the plant food in the manure and enable it to be taken up by the soil.

Cover crops and green manure. Crops are frequently planted in the fall to cover ground which would otherwise be bare. These cover crops include mostly legumes like clover, alfalfa, soy beans, and cowpeas. Rye is not a legume but it is a favorite cover crop. These crops grow during the fall and early spring and are plowed under in their green state before the garden season begins. Green cover crops that are plowed under in the spring to add humus to the soil are called *green manure*. This manure improves the physical condition of the soil and adds plant food for the next crop.

Seed boxes, tools, and apparatus. Prepare your seed boxes and hotbeds or cold frames in the fall. In the North, the soil for the seed boxes and hotbeds must be secured before the ground freezes.

All tools should be cleaned before they are put away for the winter. Oiling or greasing the iron parts will prevent their rusting. The apparatus for drying and canning, and boxes for storing, may well be prepared in the fall.

STUDY OUTLINE

1. Why should all garden trash be destroyed in the fall?
2. Name three cover crops.
3. What is green manure? What is the advantage of using it?

HOME AND COMMUNITY WORK

Visit five gardens in your neighborhood and learn what work is usually done in them in the fall.

PROJECTS AND PROBLEMS

I SEEDS

Dissemination of Seeds

1. Wind-blown seeds. Procure fruit of the dandelion, thistle, or milkweed. Drop them from a second or third story window, and note where the seeds reach the ground. Did they fall directly to the earth? Why do some gardeners who practice clean cultivation have difficulty in keeping their gardens free from weeds?

2. Seeds of edible fruits. Cut an apple or pear in quarters. Notice the position of the seed with reference to the pulp. How may seeds from the core of an apple, pear, or similar fruit become widely scattered? How are seeds of the raspberry, blackberry, or strawberry disseminated? How do birds aid in scattering the seeds of edible fruits?

3. Seeds carried by animals. Gather the fruit of the Spanish needle, cocklebur, and burdock. Examine them and see how they are equipped to adhere to clothing or to the hair of animals and in this way may be carried from place to place. Put one of these or a similar bur in your own clothing or in the hair of a dog or cat and see how long it will remain.

4. Seeds that float. Put sound hickory nuts or walnuts in water. How long do they continue to float? How might such nuts be carried long distances? Find out how some of the small islands in the ocean were planted with palms by floating coconuts that washed upon their shores.

5. Seeds discharged from bursting pods. Set pods of the bean or pea away to dry. Later, when they are quite dry, handle them roughly and note the result. Observe a bean patch where the pods have become over-ripe.

Testing Garden Seed for Purity and Vitality

6. Testing for purity. Seeds to be used in the garden should be pure, that is, not mixed with other seeds, especially weed seed. Obtain a sample of pure seed from an experienced and reliable gardener, or from the state experiment station, or from the United States Department of Agriculture. Measure and

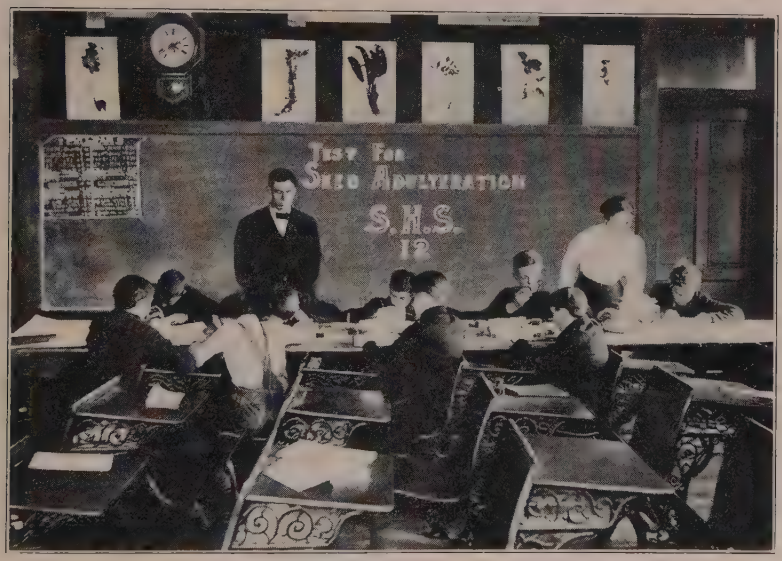


Fig. 82. *Preparing for spring planting. A schoolroom class at work testing seeds for purity.*

weigh a small quantity of the sample procured. Using the same measure, take an equal quantity of the same kind of seed from that which is to be planted. How does the weight of your own seed compare with that of the sample? Examine your own seed carefully, comparing it with the standard sample to determine the percentage of good seeds, of foreign seeds, and of trash. Record the results in each case.

7. Testing for vitality. Pure seed may contain many grains that are dead or of low vitality. To determine vitality the germination test must be applied. From a quantity of pure seed determined by testing for purity select 100 grains of each variety to be planted. Follow in detail the suggestions already given (Chapter XII) to determine what percentage of the pure seed will germinate and show a good strong germ. Remember that seeds should not be planted if they show but little vitality when placed in the germinator.

Testing Seed for Food Substances

From the next four exercises we determine that the principal food substances in seeds are protein, starch, sugar and fat.

8. Testing for protein. Put a drop of nitric acid on the white of an egg. The yellow stain resulting indicates the presence of protein. Likewise put two drops of nitric acid on a part of a bean or pea. Compare the result with that obtained when acid was put on the white of an egg. Record result.

9. Testing for starch. Put two drops of iodine solution upon a small bit of starch paste. The dark blue or blackish color resulting indicates that starch is present. Now put two drops of iodine solution upon a portion of a fresh seed. Then compare the result with that obtained by placing the solution upon the starch paste. Record results.

10. Testing for sugar. The presence of sugar in seeds can frequently be detected merely by tasting the seed parts.

11. Testing for fats and oils. Scrape the seed parts with a knife. Place the small particles which result upon a piece of white paper. Lay this paper upon a plate and heat it slowly. Observe the effect upon the paper and record it.

12. Studying garden seed. Procure samples of seed of all the garden crops cultivated in your community. Study these carefully and learn to distinguish each by name.

II SOILS[1]

1. Studying soil for texture.

Material: Samples of clay, gravel, sand, loam, leaf mold.

Compare these samples of soils carefully and note the different textures of each.

2. Testing soils for retention of water.

Apparatus: Five glass bottles or fruit jars; five large funnels; a piece of muslin.

Material: Soil of each of the kinds given above; water.

Fill each funnel with one kind of soil, using equal weights for all. Tie a piece of muslin over the small end of each funnel to prevent the earth from washing through. Then place the five funnels in the five glass fruit jars or bottles. Pour an equal quantity of water in each funnel and note at the same time which soil permits water to pass through the fastest, which holds it longest, and which retains the largest volume. Determine the rank of each soil according to its capacity for retaining water. After two or three pourings of water weigh the funnels and note the differences in their weights. Which soil retained the most water? Which soil would dry out the soonest after a heavy rain? Which soil would be ready to plow first in the spring? Which soil would best stand a very dry summer? Which would best stand a wet summer?

3. Showing rise of water in soils (Capillarity)

Apparatus: Five baking powder cans.

Material: Soil of each of the kinds given above; water.

Punch several holes in the bottom of each can. Fill each can with a different kind of soil and set them in a pan containing water. Do not set the cans flat on the bottom but on the edges

[1] Part of the material for the exercises in the second and third groups of these projects are taken from the author's work entitled, *Agriculture in the Public Schools*, and from bulletins of the United States Department of Agriculture and the State Agricultural Colleges of the several states.

of two small boards previously placed in the pan. Water will rise in the cans through the holes in the bottom. In which can does the soil first show moisture at the top? Which last? Beginning with the most porous write the soils down in regular order.

4. Showing effect of drainage.

Apparatus: A can or a milk crock; a flower pot or a can with a hole in the bottom.

Material: Clay or loam; seeds.

Fill each can or crock with clay or loam, and plant the same kind of seed in each. Set the cans in a warm, light place and every day or two for ten or fifteen days pour an equal quantity of water in each. Now note which plants grow the better, those in the container with holes in the bottom to admit air and allow drainage, or those in the solid can or crock?

5. Showing effect of air in soils.

Apparatus: Two chalk boxes.

Material: Loam; clay or leaf mold; seeds.

Fill one box with loam, loosely packed. Fill the other with clay or leaf mold, packed tightly. Plant the same kind of seed in each box and give both the same attention. In which does the plant seem to grow the better?

6. Showing need of ventilation or effect of air on plant growth.

Apparatus: A bottle with a tightly fitting cork.

Material: Beans; water.

Soak some beans in water for about twenty hours. Fill the bottle about two-thirds full with the soaked beans. Pour in water until it stands half an inch above the beans. Cork the bottle tightly. The seed may sprout but will not grow. Why not? When the cork is removed a lighted paper placed inside will not burn. Why not? When the surplus water is removed and fresh air is admitted the beans start to grow. Why? Does drainage assist in ventilating soils?

7. Showing that seeds need plant food.

Material: Seeds; pure sand; rich soil or fertilizer.

Plant seeds in the sand and keep it damp. Note that the seeds sprout but do not grow. Why not? Add rotten leaves, stable fertilizer, or good black dirt. Note the change in the plant.

8. Showing advantage gained by improving the soil.

Apparatus: Four boxes about 3x4 feet in size.

Material: Soil; stable manure; two grades of commercial fertilizer; seeds.

Fill all the boxes with the same kind of soil. In the first mix a small quantity of stable fertilizer, in the second a small quantity of high grade commercial fertilizer, in the third the same quantity of cheap commercial fertilizer, and in the fourth omit the fertilizer. Plant the same kind of seed in each box; give all the plants the same cultivation. Notice the difference between the plants in the fertilized and the non-fertilized soils.

9. Showing need of heat in soil.

Apparatus: Two cans or crocks.

Material: Soil; seeds.

Fill cans or crocks with the same kind of soil and plant the same kind of seed in each. Place one where it will be light and warm, the other where it is cold (not freezing) and light. Note the difference in growth. What can a gardener do to add warmth to his soil?

10. Showing change of heat in soil.

Apparatus: Two cans; a thermometer.

Material: Dry sand or loam; wet sand or loam.

Fill one can with the dry soil and the other with the wet soil. In each can place a thermometer about half an inch under the surface of the soil. Set the cans in the sunlight. Observe the change of temperature of each can from time to time. Which has the higher temperature? What effect will tile drains have on temperature?

11. Showing effect of a mulch on the moisture-retaining properties of the soil.

Apparatus: Four small boxes 6 inches deep.

Material: Rich soil; sand; cut straw; water.

Fill each box half full with the same kind of soil. Pour the same quantity of water into each box. Cover the soil in the first box with 2 inches of dry sand; in the second box cover with 2 inches of loose, dry soil of the same kind as that already in the box; in the third box cover with 2 inches of cut straw; in the fourth cover with packed soil of the same kind as that already in the box. Weigh the boxes and record the weight of each. In ten days weigh all the boxes again. Which box lost the most moisture? Which box lost the least? Why should the gardener stir the soil frequently? Should the ground be plowed frequently in dry weather? Why?

12. Showing effect of fertilizer on crops.

When fertilizing your garden crops skip a few feet here and there and as the season progresses note the difference in the growth of plants that received the fertilizer and those that did not.

13. Detecting acids and alkalies in soils.

Material: Red and blue litmus paper; vinegar; ashes: samples of soil.

Vinegar has a sour taste and contains an acid. A piece of blue litmus paper dipped in vinegar will turn red. Dip blue litmus paper in several samples of soil and see if the paper changes to red. If so, the soil is sour and needs a coat of ashes or lime to neutralize the acid and thus sweeten the soil. Red litmus paper placed in moist ashes turns blue. Ashes contain potash and lime which are alkaline. If the red litmus paper placed in your soil turns blue, your soils are alkaline. Alkaline soils need a fertilizer rich in acid to be neutralized. When the paper is not changed at all the soil is said to be neutral. Good producing soils are usually neutral, although they may sometimes be slightly alkaline.

14. Comparing plant-food value of top soil and subsoil.

Apparatus: Two cans of equal size.

Material: Soil; subsoil; seed corn.

Obtain subsoil by digging down 3 or 4 feet in ordinary ground. Be sure to get below the top soil. Fill one of the cans with this subsoil. In the other can place the good surface soil obtained directly above the subsoil. Plant corn in both cans and keep both cans under the same conditions as to heat, sunlight, and moisture. After about ten days to two weeks, compare the size of the stalks of corn. Why does corn, or any other garden crop, planted in a dead or unfilled furrow usually make a small growth? Did you ever plant flowers or vegetables in earth that had been thrown out of a cellar or deep ditch? Try this some time. Will subsoil gradually improve the longer it is exposed to the elements? Why?

15. Comparing plant-food value of worn-out soils and new soils.

Apparatus: Two boxes about 2 feet square.

Material: New soil; worn-out soil; seed corn or flower seeds.

Fill one box with new soil obtained in new ground, that is, ground which has never been tilled, or by digging about 2 or 3 inches below the surface in an open forest. Fill the other box with soil taken from about the same depth in a field where the soil is old and run down. Plant corn or flower seeds in each box and place the boxes under similar conditions as to sunlight, heat, and moisture. Watch them from time to time and after five or six weeks compare and note the difference, if any, in the size of the plants in each.

What process will partially restore the plant foods in worn-out soils? Why is crop rotation a benefit to the soil? Why does drainage make more plant food available? How does good tillage improve a crop?

III PLANTS

1. Studying root conditions.

Material: Roots of several weeds and vegetables.

Compare these roots and note the differences. Which roots are fibrous? Which fleshy? Which are long tap roots? To observe root hairs, sprout wheat, oats or beans between moist blotting paper.

2. Showing root conditions of legumes.

Material: Roots of clover, cow peas, vetches, and alfalfa plants.

Gather these so carefully that all the roots will be preserved. Wash the roots with care and note which has the greatest number of nodules. Which is the best for improving the soil?

3. Finding stamens and pistils.

Material: A perfect strawberry blossom.

Perfect flowers have both stamens and pistils present. Find such a flower in the strawberry patch and point out these organs.

4. Comparing perfect and imperfect flowers.

Material: A perfect and an imperfect strawberry blossom.

Flowers having pistils and not stamens are imperfect flowers (pistillate). Find such a strawberry blossom and compare it with the former.

In Chapter LXII you have an illustration of what must take place before an imperfect flower will produce fruit. What kind of flower is found on Indian corn? Where are the stamens on the corn plant? The pistil?

5. Showing what is necessary to produce seed.

Material: Perfect and imperfect cucumber blossoms.

Cover up a few flowers that contain only pistils. Did any seed develop? Why not? Will flowers that contain only stamens (staminate) ever produce seed? Why not? How are new and improved varieties of plants obtained?

6. Learning to know troublesome weeds.

Material: A good specimen of each of the following troublesome weeds: Burdock, Canada thistle, ox-eye daisy, cocklebur, pig-weed, toadflax or butter-and-eggs, sow-thistle, sour-dock, plantain, wild lettuce, wild carrot, quack grass, Russian thistle, wild parsnip, horse-tail, iron-weed, and others that may be common in your neighborhood.

Learn to recognize each of these weeds and to know its name. Can you tell their history? Many were brought to this country at an early day and were planted for ornamental purposes. Find out which ones. Make a collection of weed seeds and learn to distinguish each kind by name. (Consult *Ohio Weed Manual* published at Wooster Experiment Station, Wooster, Ohio, or *Farmers' Bulletin 28*, United States Department of Agriculture, Washington, D. C.)

7. Propagating by tip layering.

Material: A black raspberry branch.

Bend the tip of a branch of black raspberry over to the ground and cover it with earth. It will soon take root and form a new plant. Try this several times and see how many new plants can be started from one old plant.

8. Propagating by vine layering.

Material: A long branch of grape vine.

Bend the branch down flat on the ground and lay it in a small trench in the ground. Cover it entirely with earth. Roots will put out at intervals and branches will come up through the ground. Afterward you can cut the old vine between each pair of new shoots and thus have several new plants. Try this and see how many new plants you will have gained by covering some old vines.

9. Propagating by mound layering.

Material: A gooseberry or currant plant.

Take any plant which *stools*, as the gooseberry or currant, and

throw up the earth in a mound around the plants, so as to cover the bases of several of the stems, say 4 or 5 inches deep. This

FIG. 83. *Second grade pupils learning how to propagate plants.*

will cause each stem to throw out roots and thus make several individual plants.

10. Developing mold from spores.

Material: A piece of damp bread; a potato.

Set the damp bread in a dark place and let it mold. Take a piece of potato or potato peeling and place some of the mold from the bread on the surface of the freshly cut edge. Lay the potato away in a damp, dark place and observe occasionally the growth of the mold.

11. Learning to propagate strawberry plants.

Material: A strawberry plant.

Strawberries propagate by runners. Plant some strawberry plants. After they have been well cared for and reach a good

size notice the number of runners sent out and the new plants that have been formed the same season.

12. Showing that plants require light for growth.

Apparatus: Two cans filled with earth.

Material: Some beans or grains of corn.

Plant a few beans or grains of corn in each can. Place one can in a light place and the other in the dark, but under the same conditions with regard to soil, heat, air, and moisture. Note the difference in their growth. Why are plants in the field and orchard that grow in the shade inferior to those that grow in the open? Why are corn plants that grow directly under the shade of a tree inferior to those grown in open fields? Is there more than one reason? Why are low buds on trees in a dense forest only slightly developed? Why are trees in a dense forest tall with only a few limbs growing high on the trunk? How are the trees grown which are used for telephone and telegraph poles? Which make the better logs, tall straight limbless trees, or low heavy-bodied and heavy-limbed trees? Why?

13. Showing that plants require heat for growth.

Apparatus: Two cans filled with earth.

Material: Some corn or beans.

Plant corn or beans in each can and keep them under the same conditions with regard to soil, moisture, air, and sunlight. Keep one can in a temperature of about 70° to 80° F., the other in a temperature of from 20° to 30°. Now notice the difference in growth. Early winter or late fall is the best time to try this experiment.

14. Showing that moisture is essential to plant growth.

Apparatus: Two cans filled with earth.

Material: Some corn or beans.

Plant corn or beans in each can. Keep both under the same conditions except that all moisture is to be kept from one. Note the difference in growth.

15. Showing that air is essential to plant growth.

Apparatus: Two cans filled with earth.

Material: Some corn or peas.

Plant corn or peas in both cans. Keep both under same conditions except with regard to moisture. Use only a moderate quantity of water in one can with drainage. In the other use a large quantity of water without drainage. The excess of water in the latter case will exclude so much air that the plant will be affected. Note the difference. What effect has a number of cold, wet rains in the spring upon the planted corn? What soil is best for carrying off surplus moisture? What are the uses of tile drains?

SECTION TWO
THE PRESERVATION OF GARDEN CROPS

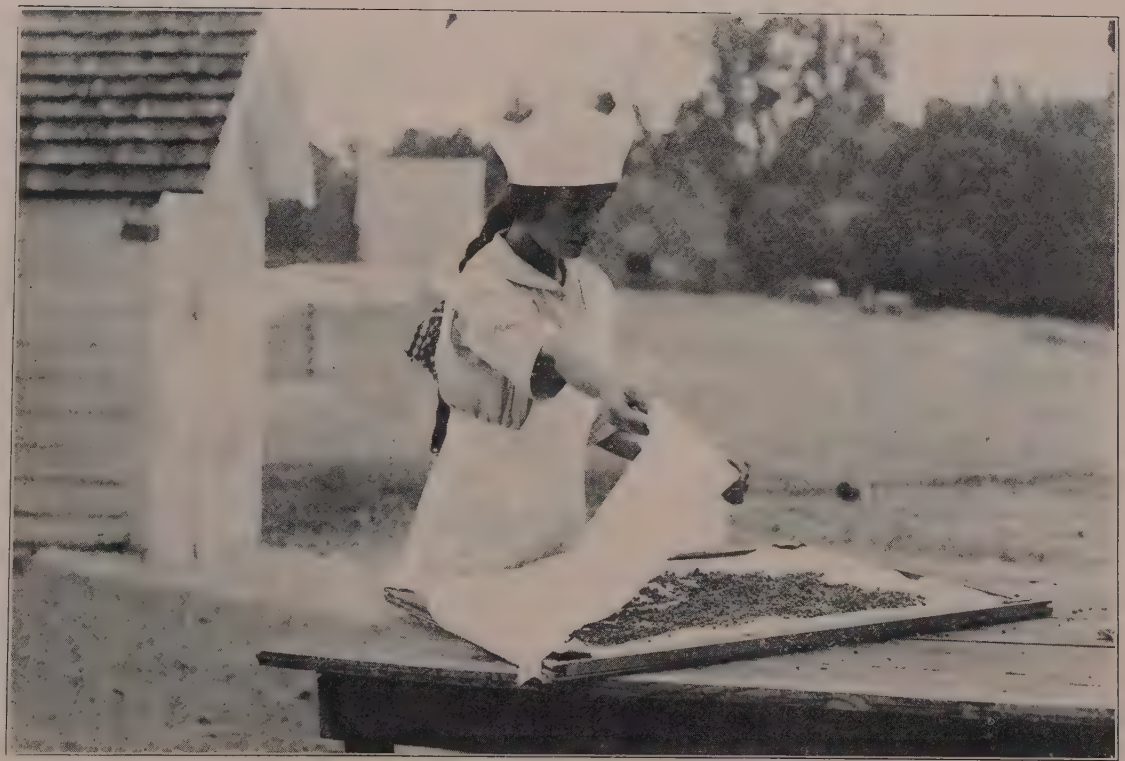


FIG. 84. *Drying sweet corn in the open air.*

CHAPTER LXX

WHY AND HOW WE PRESERVE FOODS

There was a time in the world's history when man did not preserve foods for winter use. This neglect, due to ignorance, often caused famine in many lands. The world could not prosper and develop when abundant food was not to be had at all seasons of the year. For this reason people began to study ways and means of keeping for winter and spring use the food so abundant during the growing season. This study was continued, until to-day as the result of the combined effort of so many persons we have perfected methods whereby foods may be kept for years.

How we came to preserve foods. It has been said that berries that had dried naturally upon their vines and bushes first suggested the idea of drying foods. Later, as the result of accident, the methods of preserving by pickling in brine and vinegar and by salting were discovered. Preserving by canning, too, was the result of chance and was practiced for years before it was learned why heating and sealing in air-tight jars prevented spoiling.

Why foods spoil. After years of study it has been proved that spoiling and decay are caused by the presence of ferments (yeasts), molds, and bacteria. After this became known, the problem of the preservation of foods became a simple one, for all that was necessary was to find some way to kill these plants or to prevent their growth.

How foods are preserved and stored. When our grandmothers dried fruits and vegetables they prevented the

growth of destructive agents simply by taking away the water necessary for their growth. When the water was removed the germs became harmless although they were not killed. Later those who began pickling, salting, preserving, and jelly-making were unconsciously using preservatives. Yeast, molds, and bacteria do not grow where salt, sugar, vinegar, or spices are present in large quantities.

Food may be kept for long periods in cool cellars and refrigerators because the little plants that destroy foods are like garden plants—they grow well only in a fairly warm temperature. Keeping food in cold places does not destroy these plants, it only retards their growth. When the food is removed to a warmer temperature they will revive and cause it to spoil.

In canning food we accomplish two things: First, by heating it we destroy all molds, yeast, and bacteria—as well as their seeds or spores—that are present in the food; second, by enclosing it in air-tight containers we prevent more germs or their spores from entering it.

Vegetables and fruits may be preserved in their natural state for a limited time by storing them in indoor and outdoor cellars, in pits, cold frames, and in cool or warm rooms.

Why surplus food should be conserved. The constant use of fruits and vegetables is essential to good health. Since vegetables and small fruits are so abundant at certain seasons and so expensive and difficult to obtain at others, it is highly important that during the growing season every family should preserve enough of such perishable food to last through the winter. The variety of diet which good health requires may be maintained throughout the year by conserving the surplus of the summer crops.

Food production in the world does not keep step with the increase in population. Each year our surplus food supply grows less. For this reason we must not only know the best methods of producing garden and other food crops and thus increasing the food supply, but we must also learn how to preserve them in the most economical manner.

STUDY OUTLINE

1. What was one cause of famine in the early history of the world?
2. What first suggested drying foods?
3. After drying, what methods of preserving were discovered as the result of accident?
4. Why does drying prevent the decay of foods?
5. When foods are pickled, salted, or otherwise preserved, what prevents decay?
6. Why do foods keep longer in cold storage than in ordinary temperatures?
7. What two things are accomplished when foods are canned?
8. What other methods are used in the preservation of foods?
9. Why should fruits and vegetables form a part of our regular diet?
10. Why should more attention be given to the preservation of foods?

HOME AND COMMUNITY WORK

Visit five homes in your neighborhood and be prepared to answer the following questions:

1. How many preserve food by drying? What foods do they preserve by this method?
2. How many preserve food by pickling or salting? What foods do they preserve by this method?
3. How many preserve food by canning? What foods do they can?
4. How many store foods in the natural state? What foods do they store in this way?
5. Are any other methods of preservation used? If so, what methods are used and what foods are so preserved?

CHAPTER LXXI

CANNING: ONE-PERIOD COLD-PACK METHOD

Garden products may mature in larger quantities than the family can use. To prevent waste it is wise to can them. We have long been accustomed to this mode of saving fruit. But the canning of vegetables has been considered too difficult to be done satisfactorily at home. The process, however, is a simple one and not only saves waste but affords an appetizing supply of good food for the winter months.

Cold-pack method of canning. The one-period cold-pack method is the best for canning vegetables and fruits, especially in the North. In hot climates other methods of canning are preferred by many experienced canners.

Equipment. The equipment should consist of deep pans for blanching (Fig. 86) the vegetables and fruit; a wire basket, or steamer, or several yards of cheesecloth for use in blanching; a knife for removing air bubbles in containers; spoons; a knife for paring; a pan for cold dipping; salt for vegetables; glass cans to hold the fruit and vegetables; new rubbers; and an apparatus for sterilizing. There are many outfits for sterilization on the market but a home-made one will answer every purpose. Select a large tin pail with a well fitting cover (Fig. 85). There should be a faucet at the bottom to empty the water quickly and easily. Place a smaller pail, well perforated, inside the larger one. A wash boiler (Fig. 90) is frequently used instead of the large pail, while a galvanized wash tub is excellent if provided with a cover. In the bottom of these, racks should be placed

to keep the jars from touching the bottom and coming in direct contact with the heat. The racks may be wooden slats (Figs. 85 and 90) or woven wire.

Preparation for canning. Select the containers — either glass jars or crockery — and place them in a convenient

FIG. 85. *Galvanized pail and wooden rack. An inexpensive equipment for canning.*

place. Never use old rubbers. Buy new ones every year, since rubbers deteriorate from one season to another. The products should be fresh. If possible, fruits and vegetables should be picked the day they are to be canned. Peas and corn, which lose their flavor rapidly, should be canned if possible within four hours after gathering. Fit the tops to the jars carefully before beginning. The containers should be washed. They should next be placed in a vessel of clean, cold water, and set over a fire to heat. They will be hot and ready for the fruits or vegetables by the time these have been prepared for packing. If glass lids are to be used, they may be placed in the water with the cans. If screw tops are used, boil them for fifteen minutes in separate water. After selecting clean, sound, fresh products for canning, wash carefully, trim, and cut into pieces if necessary.

Steps in the canning process. The cold-pack method consists of five steps: scalding or blanching, cold dipping, packing, sterilizing, and sealing. It is very important to observe the first two steps with all vegetables and some fruits. In canning berries and soft fruits the first step is omitted.

FIG. 86. *One process in canning. Blanching vegetables by putting them in cheesecloth and dipping them in boiling water.*

Blanching. Scalding or blanching insures thorough cleansing and removes objectionable odors and flavors, also excess acids. The process consists of lowering the vegetables or fruit into boiling water for a short time (Fig. 86). For this purpose they are placed in the wire basket or a piece of cheesecloth. The blanching time varies from one to twenty minutes, as shown in the table (page 258).

Spinach and other greens must not be blanched in hot water. They should be scalded in steam so that they may better retain the volatile oils. To do this place them in a steamer with a tightly fitting cover, and set it over another

vessel in which there should be an inch or two of boiling water. The water must not be allowed to touch the greens.

Cold dipping. As soon as the vegetables or fruits are removed from the boiling water or steam, they should be dipped in cold, clean water, then removed quickly and drained. This hardens the pulp and sets the coloring matter. Do not allow them to stand in the cold water.

Packing. This step should follow immediately after the cold dipping. Spoilage of products is sometimes due to carelessness in one of these two steps. The products should be packed in the containers as closely as possible. Where fruits are intended for table use, enough sirup should be placed over them to fill the jars.

In the case of vegetables, fill the can with hot water immediately after packing, remembering that the glass must be warm when the hot water is poured in or it will break. Add 1 level teaspoonful of salt to each quart jar of vegetables, ½ teaspoonful to each pint. Put the rubber rings and the scalded tops of the jars in place and partly seal the tops of the cans. If the glass top is used, pull only the upper wire across the cover to hold it in place. If the screw top is used, tighten the lid, but not quite enough for final sealing. When the jars are ready place them in the sterilizing apparatus, which in the meantime has been filled with hot water.

Sterilizing. The final application of heat is known as sterilizing. The process consists of boiling the packed cans of fruit or vegetables in water (Fig. 90) for a period determined by the character of the product (consult table, p. 258).

The boiling water in the sterilizing outfit should be kept 1 inch above the tops of the cans of fruits or vegetables.

FIG. 87. *Members of a boys' class grading beans for canning.*

FIG. 88. *Two members of a canning class sealing jars.*

This will insure a sufficient amount of liquid in the cans when they are taken out.

Sealing. After the termination of the sterilization period the cans should be lifted from the apparatus and sealed tightly at once (Figs. 88 and 89).

FIG. 89. *Sealing jars of fruit canned by the one-period cold-pack method.*

Set the jars upside down in a tray to cool. Examine them for leaks. If any occur the covers should be tightened until the jars are air-tight. Most products packed in glass jars will bleach or darken if exposed to light. It is therefore best to put the jars in paper bags or wrap them in paper.

The following chart is based upon government home-canning work.

Fruit and Vegetable Canning Chart

Fruits and vegetables	Preparations	Sterilize in hot-water bath outfit 212°F. Minutes
Soft fruits: Strawberries, blackberries, raspberries, grapes.	Grade, rinse, stem, pack whole; add hot sirup.	16
Sour fruits[1]: Currants, gooseberries.	Stem, rinse, blanch in hot water 1 minute; dip quickly in cold water; pack whole, closely; add hot sirup.	12 to 16
Vegetable greens: Asparagus, spinach, cauliflower, Brussels sprouts, beet tops, Swiss chard, kale, endive, green or red peppers.	Blanch in steam from 15 to 20 minutes; dip in cold water; cut in convenient sizes; pack tight; season to taste, add salt and hot water.	120
Pumpkin, squash, sweet potatoes.	Remove shell of pumpkin and squash; steam medium soft; pack tight. Steam sweet potatoes; remove skin; pack tight.	120
Tomatoes.	Scald long enough to loosen skins; dip quickly in cold water, core and skin; pack whole; add salt and hot tomato juice or hot water.	22
Corn.	Blanch in boiling water on cob from 5 to 15 minutes; dip quickly in cold water; cut from cob with sharp knife; pack loosely; add salt and hot water.	180
Legumes: Peas, lima beans, string beans.	Cull, string, grade; blanch 5 minutes in boiling water; dip quickly in cold water; pack whole; add salt and hot water.	180
Roots: Beets, carrots.	Cleanse thoroughly; scald till skin is loose; dip quickly in cold water; remove skins; pack whole or in cubes; add salt and hot water.	90

[1] Use same plan for rhubarb as suggested for currants and gooseberries.

Time for sterilizing. The time for sterilizing is based on quart jars. For half-gallon jars increase the time 30 minutes; for pint jars, deduct 5 minutes.

The time given is for fresh products at altitudes up to 1,000 feet above sea level. For higher altitudes increase the time 10 per cent for each additional 500 feet.

FIG. 90. *Here at the right the teacher is seen placing the rack in the washboiler, and at the left, the pupil ready to place the filled jars in the boiler.*

Sirups. Thin sirups may be used to save sugar as follows: 1 cup sugar to 3 cups water and boil 2 minutes; or 1 cup corn sirup, 1 cup sugar, and 3 cups water. Bring to a boil and pour over fruit in jars.

About 1½ cups sirup are required for 1 quart of closely packed uncooked fruit.

Corn sirup may be used successfully in varying proportions in canning, preserving, and jelly-making.

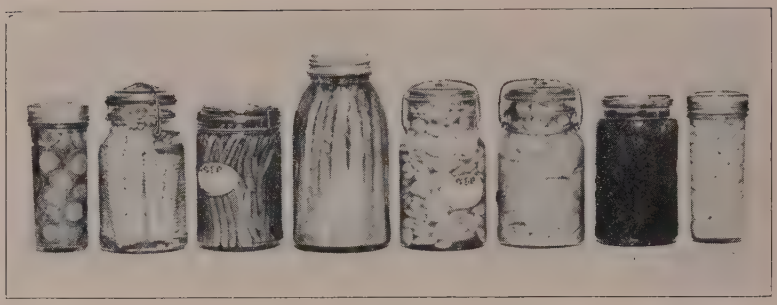


FIG. 91. *Eight varieties of vegetables successfully canned by the one-period cold-pack method.*

Begin to calculate the time from the moment the water in the canner reaches the boiling point.

STUDY OUTLINE

1. What equipment is needed in canning by the one-period cold-pack method?
2. How many steps are necessary in canning by this method?
3. Describe each step.
4. Give work required in canning one soft fruit, one sour fruit, one vegetable used for greens, sweet potatoes, tomatoes, corn, one legume, and one root crop.

HOME AND COMMUNITY WORK

Visit ten families in your neighborhood and be prepared to answer the following:

1. How many use the one-period cold-pack method of canning?
2. What fruits and vegetables were canned by this method?
3. What other methods were used that were successful?

CHAPTER LXXII

PRESERVING AND JELLY MAKING

Preserves. The small fruits, including strawberries, raspberries, blackberries, gooseberries, currants, and grapes, may be made into preserves by cooking with sugar until quite thick and then put in jars and sealed while hot. The proportion of sugar required varies according to the acidity of the fruit.

The fruits must not be overripe when preserved. Care must be used in handling if the fruit is to remain whole. Use a shallow kettle when making the preserves, because a large kettle and a heavy mass of fruit would destroy the shape of the individual berries, currants, or grapes.

Jelly. Fruit juice containing both pectin and acid can be made into jelly. *Pectin* is a substance in the fruit which is soluble in hot water and which when cooked with sugar and acid has, after cooling, the proper consistency of jelly.

The proportion of sugar to juice depends on the quantity of pectin contained in the fruit juice. A larger proportion of sugar can be used with a juice rich in pectin than with one poor in pectin. When too much sugar is used the juice will form a sirup and will not jelly.

Overripe fruit contains too little pectin, for this reason it is better to select for jelly making fruit that is underripe.

The fruits mentioned in this chapter, with the exception of strawberries, are ideal for jelly making, because they contain pectin and acid in sufficient quantities. Strawberries have acidity, but are lacking in pectin. The pectin,

however, may be supplied by the addition of juice from underripe grapes or crab apples. For the best results grapes and gooseberries should be used before they are quite ripe.

Directions for making jelly. Select fruit in good condition for jelly making, which means that it must be firm and not too ripe. Wash it and remove the stems. Put in a saucepan and cover with water. Cook slowly until very soft. Pour into a thick muslin bag to drain (Fig. 92). When the juice has drained from the pulp measure it. The sugar must also be measured and the following proportions may be used: For 1 cup currant juice, green gooseberry, or underripe grape juice, use 1 cup sugar. For 1 cup raspberry or blackberry juice use ¾ cup sugar.

FIG. 92. *A jelly strainer.*

Pour the juice in a pan and when it begins to boil add sugar in the above proportions. Boil rapidly.

The jelly point is reached when two drops of juice run together and fall as one from the side of a spoon. When the juice reaches this point pour the hot jelly into sterilized glasses and cool as rapidly as possible.

Storing the jelly. When the jelly is cold pour a layer of hot paraffin over the surface. This paraffin will kill all germs which may have fallen on the surface of the jelly and will also keep other germs from entering. Cover glasses with tin or glass covers or paper and place in a clean dry place.

STUDY OUTLINE

1. How are preserves made?
2. How is jelly made?
3. Name some of the most important points to be observed in making preserves and jelly.

HOME AND COMMUNITY WORK

1. What fruits are used for making jelly and preserves in your neighborhood?
2. What methods are usually practiced?

CHAPTER LXXIII

DRYING

Some fruits and vegetables can be preserved by drying as well as by canning, and drying has certain advantages which make it desirable to use this method whenever possible. Some of the advantages are the following:

1. Bulk is decreased, 100 pounds of raw food weighing only 10 pounds when dried.
2. Less space is required for storage.
3. No sugar is required.
4. Fewer and less expensive containers are needed.
5. Products can be kept for an indefinite period.

Methods of drying. Well-known methods of drying include drying by exposure to the sun (Fig. 84), by artificial heat over the stove (Fig. 95), by air currents as with the electric fan (Fig. 96), or by combining some or all of these ways.

In its simplest form drying means merely the loss by evaporation of the moisture contained in freshly cut fruits and vegetables.

Selection and preparation of food. Select young tender vegetables and fresh fruit for drying. See that the fruit is neither overripe nor underripe. Prepare and dry very soon after gathering.

Cut vegetables and fruits into slices or shred them for drying (Fig. 93). Berries are dried whole.

Most vegetables and fruits may be dried, but it is less expensive and requires less trouble to store some vegetables than to dry them.

Sweet corn, lima beans, string beans (Fig. 94), tomatoes, spinach, carrots, and Brussels sprouts are more commonly

FIG. 93. *Drying apples. The apples are spread on a wire screen and exposed to the sun.*

dried. For information on storing vegetables consult Chapters LXXV to LXXIX.

All foods should be thoroughly washed and cleaned before drying. Vegetables should be blanched and cold-dipped for successful drying, but this is not necessary for fruits. The time required for blanching vegetables that are to be dried is about the same as for canning. The blanching of vegetables gives them a more thorough cleansing, removes objectionable odors, softens the fibers and makes possible a quicker and more uniform evaporation of moisture.

Preliminary steps in drying food. In preparing food for drying there are eight steps to be taken:

1. Gather the food while in proper condition.
2. Sort it to get the best food.
3. Wash and cleanse thoroughly.
4. Blanch, using time suggested in table under canning.
5. Dip in cold water.
6. Drain off water.
7. Cut in small pieces or shred.
8. Spread out thin on boards or tables.

Drying food in the sun. When drying food in the sun select a bright sunshiny day when there is a good breeze.

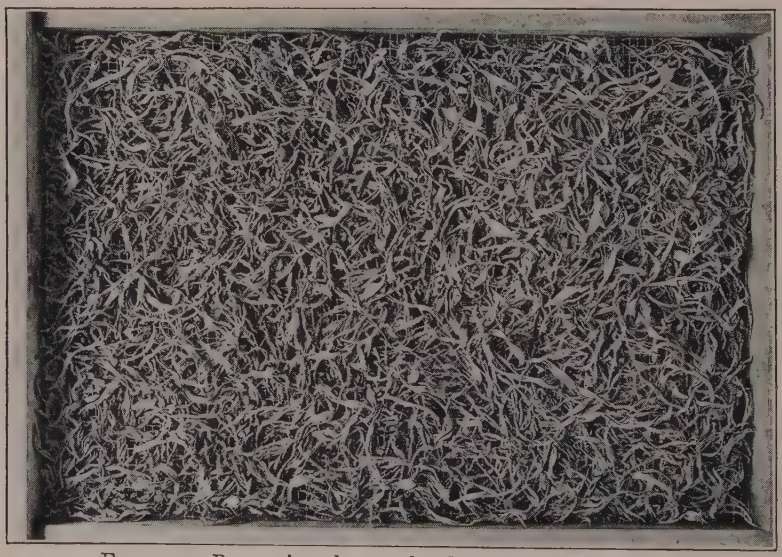


FIG. 94. *Preserving the surplus bean supply by drying.*

Fruit dries better on a hot windy day than on a hot still day. The food to be dried should be spread out thin on

trays that are exposed to the sun and breeze through the entire day. Bring food indoors before sunset as well as on damp or rainy days.

Drying food by artificial heat. When food is to be dried over the cookstove use an apparatus similar to the one shown in the illustration (Fig. 95). Expose to a gentle heat at first, increasing the temperature to 150° F. When drying in an oven, keep the door partly open to allow the moisture to escape and prevent overheating the product. Shelves or trays may be used over the top of the stove (Fig. 96).

FIG. 95. *A home-made drier constructed of lath and wire netting.*

The electric fan is a common means of drying vegetables and fruits by air. Place trays one above the other in front of the fan (Fig. 96).

Test for dried products. Dried products should have a leathery and pliable feeling when pressed in the hand. They should not rattle or crack when poured together.

Preparing dried food for use. In preparing dried food for the table the object is to replace the water lost by evaporation and to develop flavor. To do this soak the food in cold water over night and cook slowly. Each year more vegetables and fruits should be dried in order that a greater supply of food may be preserved for the use of the family. The health of the family will be improved if an ample supply of fruits and vegetables are preserved for winter use.

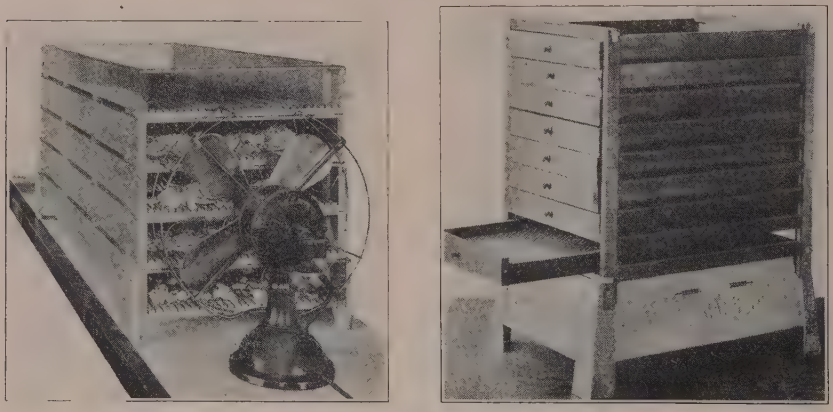


FIG. 96. *Two devices for drying. The drier at the right is set on top of the kitchen stove, where the hot air rises through the trays. The electric fan dries the food in the trays at the left.*

STUDY OUTLINE

1. Give five reasons for drying foods.
2. Describe three methods of drying food.
3. Why should vegetables be blanched before drying?
4. Give eight necessary steps in the drying of food.
5. Explain the process of drying food in the sun.
6. Explain drying by artificial heat.
7. Give a test for properly dried food.
8. How are dried foods prepared for table use?
9. Why should more food be dried each year?

CHAPTER LXXIV

FERMENTATION AND SALTING

Preserving food by fermentation and salting is a very common practice in Europe, but in America the method is not extensively used because of our ability to procure fresh vegetables at almost any season of the year. Perhaps sauerkraut and salt pickles are the most important foods that we preserve in this way.

Methods. There are three methods used in preserving foods by salting: (1) Fermentation with dry salting; (2) fermentation in brine; and (3) salting without fermentation.

Equipment. The equipment should consist of scales and a measure; water-tight containers, not of metal but stone crocks or glass jars; a supply of salt; clean white cheesecloth for covering the material after packing in the container; a board (not of yellow or pitch pine) cut the shape of the container and made to fit down as closely as possible on top of the cheesecloth; or a plate for this purpose if the container is small; one or more clean stones to place on top of the board or plate to serve as weight upon the contents. To insure greater protection against mold, paraffin is sometimes poured over the liquid in the container after fermentation has ceased. The vital factor in preserving is the lactic acid which develops in fermentation.

Fermentation with dry salting. Cabbage (sauerkraut), string beans, and turnips are the most common vegetables preserved by this method.

In preparing sauerkraut cut cabbage fine and place it in a crock or other container. Remove the outside leaves from mature, sound, clean heads and pack immediately after cutting. Mix the cut cabbage with salt by first putting a layer of salt in the bottom of the container, then three or four inches of cabbage, then a layer of salt, and so on until the container is full or the cabbage all used. The salt should be distributed evenly through the cabbage and be used at the rate of 1 pound for 40 pounds of cabbage.

Pack the cabbage firmly by pounding it lightly with a wooden mallet after the addition of each layer. When the container is full, sprinkle salt on the top layer of cabbage and cover with two thicknesses of cheesecloth, being careful to tuck the cloth down at the sides. Place upon the cloth the board cover or plate that exactly fits inside the container. On the board or plate put a stone or clean bricks, the size of the weight depending upon the quantity of material being preserved. For a 5-gallon crock use a 10-pound weight. This weight together with the action of the salt should be sufficient to extract the juices and form a brine which should cover the top in twenty-four hours. If the brine does not rise above the cover in that time add more weight on the board. Be sure that the weight is sufficient to keep the kraut beneath the surface of the liquid.

After the container is packed set it in a warm room for ten days or two weeks. In a cellar or cool room it will take from three to five weeks to ferment. In other words, the rate of fermentation depends principally upon the temperature. After the sauerkraut begins to ferment a film appears which should be skimmed off. As fermentation continues bubbles will rise to the surface of the liquid.

If when the side of the container is tapped gently no more bubbles rise, then the sauerkraut has stopped fermenting and is ready for use. Before setting away in storage remove any scum that has formed and cover over with hot paraffin until it makes a layer ¼ to ½ inch thick. This paraffin is used to prevent the formation of scum if the weather is warm or if the storage room is not well cooled. When kraut is made in the fall and stored in a cool place the addition of paraffin is not necessary.

String beans and turnips may be pickled in the same way. Select young vegetables. Remove the tip ends of string beans and either break or leave whole. Pare and slice turnips and place in container.

Fermentation in brine. Cucumbers, string beans, green tomatoes, corn, beets, and green peas do not contain sufficient water for a good brine when salt alone is used. For such vegetables a previously prepared weak brine made of 1 gallon of water, ½ pint of vinegar, and ¾ cup of salt must be added. The quantity of brine needed to cover the vegetables that have been placed in the container will be one-half the volume of the material to be fermented. The vegetables must be washed clean and drained before placing them in the crock. Set the filled vessel in a moderately warm room to ferment. When fermentation is complete place in a cool cellar or room and cover the surface in the same way as for kraut.

Salting without fermentation. By this method enough salt is used to prevent fermentation or the growth of yeast or mold. It is used for preserving cucumbers, string beans, greens for winter use, green peas, and corn.

First wash, drain, and weigh the vegetables. Use enough

salt to equal one-fourth of the weight of the material to be preserved. Put a 1-inch layer of vegetables on the bottom of the container. Cover this layer with salt. Continue with alternate layers of vegetables and salt until the crock or container is filled. Cover the whole as suggested for kraut.

If after twenty-four hours the salt and the pressure of the weight have not extracted sufficient liquid to cover the vegetables in the crock, it will be necessary to add brine. This should be made by using 1 pound of salt to 2 quarts of water. Pour enough of this strong brine into the container to cover completely the top layer of vegetables. Slight bubbling may be noted at first but it will soon stop and the container may be set aside until the vegetables are to be used. Hot paraffin may be poured over the surface as was suggested for kraut.

How to serve salted vegetables. Vegetables preserved by salting may be served as they are, or they may be freshened by soaking in clear water and cooked as fresh vegetables.

Pickling. Tomatoes, peppers, cauliflower, onions, and cucumbers are some of the vegetables that may be preserved by vinegar pickling, the acetic acid in the vinegar acting as a preservative by preventing the growth of bacteria or molds. Any one of these vegetables or combinations of two or more, seasoned with salt, sugar, vinegar, and spices of different kinds, are used in making pickles, such as catsup, chili sauce, chow-chow, tomato relish, cucumber pickles, green tomato pickles, mustard pickles, piccalilli, table relish, and pickled onions.

Soak the vegetables over night in a brine made of 1 cup

salt and 1 quart water. This brine aids in removing the water in the vegetables which if retained would weaken the vinegar used in pickling.

STUDY OUTLINE

1. How is sauerkraut made?
2. What other vegetables than cabbage may be preserved by fermentation with salting?
3. What vegetables are preserved by the use of brine?
4. Describe this process.
5. Describe the process of salting without fermentation.
6. What vegetables are preserved by this process?
7. What vegetables and vegetable combinations are used in making pickles?
8. What action takes place in pickling that prevents the growth of bacteria and molds?
9. What prevents the weakening of vinegar that is used in pickling?

HOME AND COMMUNITY WORK

1. What vegetables are preserved in your community by fermentation and salting?
2. Which one of the plans described in this chapter is most commonly used in your neighborhood?

CHAPTER LXXV

STORING VEGETABLES

Properly planned and cared for, the home garden will furnish an ample supply of vegetables for the entire year. The gardener must plan not only for summer but also for fall, winter, and early spring. He must give attention to the preservation of his vegetables as well as to the production of his crop.

Storage plans. Because of the different character of the several vegetables, the plans for storing them must be different. For convenience in discussion the crops will be divided into four groups as follows:

1. Vegetables that require cool, moist conditions with little circulation of air. The crops of this group include potatoes, carrots, beets, turnips and rutabagas, winter radishes, parsnips, and cabbages. These crops are stored in cellars and pits.

2. Vegetables that require cool, moist conditions with free circulation of air. They include celery, Brussels sprouts, kohl-rabi, endive, leeks, and parsley. These crops are stored in cold frames or on the cellar floor.

3. Vegetables that require cool, dry conditions with free circulation of air. The onion is the best example of this class. The crops of this group are stored in cool rooms.

4. Vegetables that require warm, dry conditions with free circulation of air. These crops include sweet potatoes, squash, and pumpkin. The vegetables of this group are stored in warm rooms.

Other methods of preserving garden crops besides storage have already been thoroughly discussed. They include canning, preserving, jelly-making, drying, fermenting, and salting. Some of the crops preserved in these ways are asparagus, beans, peas, beets, cabbage, cauliflower, chard, corn, cucumbers, onions (for pickling), peppers, small fruits, rhubarb, squash, pumpkin, sweet potatoes, and tomatoes. In the preceding four chapters (LXXI–LXXIV) we have been discussing these methods of preserving.

Thus we see that under proper management we can provide for the preservation of nearly all of our vegetable and small-fruit crops.

Every gardener should take note of this fact early in the season and see that nothing is allowed to waste that the family can use through the winter and spring months.

STUDY OUTLINE

1. Name four plans for storing vegetables.
2. What crops are stored by each plan?

HOME AND COMMUNITY WORK

1. What storage methods are used in your community?
2. Which ones have proved most satisfactory?

CHAPTER LXXVI

STORING VEGETABLES IN CELLARS

The vegetables in group 1 — potatoes, carrots, beets, turnips, rutabagas, winter radishes, parsnips, and cabbages — require moist conditions with little circulation of air for their successful storage. All vegetables that are to be stored should be harvested when the ground is dry. They should also be allowed to remain on the dry ground for at least ten hours in order that the surface moisture on them will have time to evaporate. All imperfect or bruised vegetables should be taken out for immediate family use. Only sound specimens should be stored.

Before putting beets, turnips, rutabages, carrots, winter radishes, and parsnips in storage, cut off the tops, leaving a stub one or two inches long to prevent the vegetable from bleeding or drying out.

The crops of this group can be successfully stored either in a cool cellar or a well-drained outdoor storage pit. An outdoor storage cellar built in a side hill is frequently used by farmers and truck growers, but is not necessary for the ordinary home gardener.

Cellar storage of this group of vegetables will be discussed in this chapter; outside pit storage of this group will be taken up in the following chapter.

Importance of cellar storage. The larger part of our vegetable crops are stored in the cellars of homes. For this reason too much importance cannot be attached to this method of storing.

In storing cabbage pull the plant from the soil so as to retain most of its roots. Remove part of the leaves before storing. If the cellar floor is cemented, cover it with two inches of soil. Put the cabbage heads upon the floor with roots upward, and cover the heads with moist soil. If preferred, the cabbages may be stored in boxes or barrels. To prevent their drying out and wilting, the heads should be completely surrounded by 4 to 6 inches of moist soil. To prevent heating, which decreases the food value of cabbage, avoid using containers that are larger than barrels.

If surrounded with moist earth or slightly damp sand all crops of this group, with the exception of potatoes, can be stored in the cellar in boxes or barrels. The moist earth prevents the roots from drying out and at the same time absorbs any disagreeable odor that may result from decaying roots.

The storage of potatoes in indoor cellars. Potatoes should be dug during dry weather. They should be left along the rows for a few hours after digging. This will permit them to dry out before storing. Care should be taken to see that no bruised or cut potatoes are placed in storage. The imperfect specimens should be used at once before they decay. Potatoes should also be graded and those of the same size placed by themselves in separate containers.

Important factors to be considered in storing potatoes are proper ventilation, avoiding exposure to strong light, protection from extreme changes in temperature, proper moisture, the size of the containers, and the condition and types of the potatoes stored.

The containers used for storing potatoes should be crates, or ventilated boxes or barrels. This will permit a free circulation of air. Boxes and barrels may be ventilated by boring holes in the sides and ends. Small containers are better than large ones because the potatoes are less liable to heat. Boxes or crates about 30 inches long, 18 inches wide, and 12 to 18 inches deep are satisfactory. All containers should be set upon slats to raise them a slight distance from the floor and thus permit the air to circulate around them.

If the cellar is a very dry one air should be prevented from circulating too freely among the stored vegetables. This is done by lining the containers with paper and placing paper over the tops. Too much dry air causes potatoes to wither.

Potatoes should not be stored in a room containing a furnace or steam pipes. A better plan is to use a room adjoining the furnace room. In moderate weather this room will not be too warm, and in long continued zero weather the door between the storage room and the furnace room can be opened occasionally to keep the temperature of the storage room about 40°F.

Before storing see that the potatoes are in as clean a condition as possible. All sprouts should be removed from the tubers as fast as they appear. The containers should be examined occasionally and all decaying potatoes removed.

Temperature for root cellars. A root cellar should be kept at as nearly a uniform temperature as possible. The temperature should not fall below freezing (32°) nor be warmer than 50°.

STUDY OUTLINE

1. What vegetables are stored in indoor cellars?
2. Tell how they are stored for winter.
3. How should potatoes be harvested?
4. What plan of storing potatoes is used by most families?
5. Describe the method of storing potatoes in indoor cellars.

HOME AND COMMUNITY WORK

Visit six persons in your community who have now or recently have had potatoes in storage. Be prepared to answer the following questions:

1. How many store in indoor cellars?
2. How many use other plans of storing potatoes?
3. Which is most satisfactory?

CHAPTER LXXVII

STORING VEGETABLES IN PITS

The vegetables of group 1 may also be stored in outside pits. They include potatoes, carrots, beets, turnips, rutabagas, winter radishes, parsnips, and cabbages.

A suitable site for the pit. The storage pit should be situated in a well-drained location such as is often found on a gentle slope, or hillside. If such a site cannot be found and it becomes necessary to locate the pit in a less favorable place, then a slight elevation should be made by throwing up the soil on the spot where the bottom of the pit is to be. This will slightly elevate the pit above the surrounding ground level and insure better drainage. Trenches 15 to 24 inches wide and 8 to 12 inches deep should be made on both sides of the pit. The trenches should be at least 6 inches lower than the bottom of the pit, so as to carry away the surplus water.

Preparing and filling the pit. The pit should be made in the shape of a mound (Fig. 97). First remove a few inches of earth. Line the bottom with leaves or straw. Place any of the vegetables of the group, except cabbage, in a pile in the form of a mound. The pile can be about 4 feet wide, 3 feet high, and long enough to include the supply of vegetables to be stored. Cover the pile with 2 or 3 inches of straw or leaves. Over this place 3 or 4 inches of earth. As cold weather increases add more covering, using first a layer of straw then a layer of earth. In latitudes where the temperature continues for some time below zero,

the covering should be increased to 12 or 15 inches. If the cold weather continues for long periods, corn stalks or stable fertilizer may be placed over the outer layer.

How to keep vegetables from heating. To prevent vegetables from heating after storing, nail four 6-inch boards together so as to form a rectangular flue. This flue should extend from the center of the pile of vegetables up through the layers of earth and straw and about 6 inches

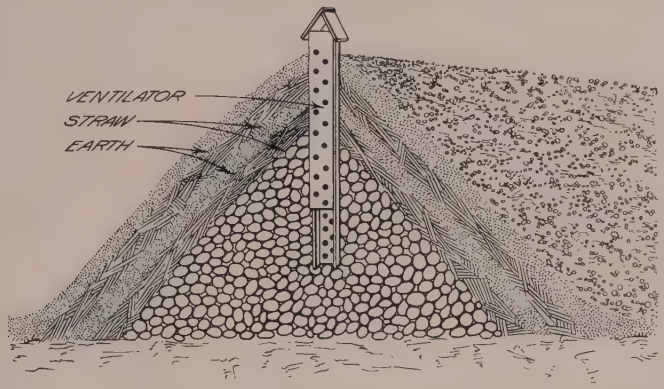


FIG. 97. *A cross section of a storage pit. Notice the ventilating flue and the arrangement of the potatoes, straw, and earth.*

above the top of the outer layer of earth. Bore holes in the sides of the flue (Fig. 97). This will aid ventilation. If the pile is long place flues every 6 feet. These may be withdrawn after continued cold weather arrives. Several small storage pits are better than one large one. The soil on top of the pit should be packed firm to help carry off the water.

Removing vegetables from pits. When some of the vegetables are needed for the household open the pit at the end. First remove the layer of straw, stalks, or top cover.

After this has been done dig down in the soil with a shovel, pick, or spade, and make a small opening reaching to the pile of vegetables. Then remove a supply sufficient for a week or two. Place them in the house or cellar where they will not freeze before they are used. Do not leave the pit open too long. After taking out the vegetables, fill the opening tightly with straw, manure, and earth. Replace the layers of straw and earth alternately as before, until there is enough covering to prevent the vegetables from freezing.

Storing cabbages in pits. Cabbages may be stored in pits in two ways:

1. Pull the cabbages from the ground, root and all. Remove a few of the outer leaves. Place 3 rows of cabbages in the pit with heads down. Above these place 2 more rows, heads down. Pack tightly together. Over the entire pile spread 6 to 8 inches of soil. Only a small quantity of top covering is necessary until very cold weather sets in, because freezing slightly will not result in much injury to cabbages.

2. Set the cabbages in the pit root down. Cover the roots with earth. Build a frame inside of the pit as follows: Drive a stake into the soil at each of the four corners and nail boards to these stakes. Bank the soil on the outside of these boards. Place poles or boards on top of the enclosure thus formed. Above these spread straw, corn fodder, or hay, increasing the amount as the cold weather continues. At one end of the pit provide an opening through which the heads may be removed.

When the heads are cut, the roots should be left in their places covered with earth. When spring comes they will

sprout and supply the family with greens. As the spring weather comes on, gradually remove the covering.

Cabbage is a valuable food for table use and will also furnish excellent winter and spring food for the hens. For this reason every family should arrange to store a sufficient supply for winter use.

STUDY OUTLINE

1. What points should be observed in selecting a site for a storage pit?
2. Describe the preparing and filling of the pit.
3. How may heating in pits be avoided?
4. How are vegetables removed from pits?
5. Give two methods of storing cabbages in pits.

HOME AND COMMUNITY WORK

1. Have any gardeners in your community made use of outdoor storage pits?
2. If so, what crops did they store in these pits?
3. Had they provided any means to prevent heating in the pits?
4. Which plan do they use for storing cabbages?

CHAPTER LXXVIII

STORING VEGETABLES IN COLD FRAMES

Celery, Brussels sprouts, kohl-rabi, endive, leeks, and parsley, vegetables of group 2, require cool moist conditions with free circulation of air. These conditions may be met by storing in a cold frame or on the floor of an indoor cellar.

How to store in cold frames. Celery should be so dug that a considerable amount of soil will cling to the roots. Set the plants with soil attached in a cold frame or in moist soil, on the cellar floor or in a box in the cellar. Moisten the soil on the roots occasionally but be sure that none of the water falls upon the leaves or stems. The other vegetables of this group may be stored in a similar manner. If a cold frame is used it should be covered with a glass sash. The sides of the frame should also be banked with earth to keep the interior warm. In the North during the coldest weather cover the glass with straw, hay, or fodder to give additional protection. The cold frame method for wintering over vegetables will probably not prove such a successful one for the inexperienced gardener as storage on the cellar floor.

Parsley for winter use. If the roots are taken out of the garden and transplanted to a box or flower pot, parsley will furnish green leaves all winter long. It can then be placed in a sunny window either in a living room or in the indoor cellar.

STUDY OUTLINE

1. Name the vegetables in group 2.
2. Tell how they may be stored.

HOME AND COMMUNITY WORK

1. Do any of the gardeners of your neighborhood store these vegetables in cold frames?
2. If so, tell how the cold frame is arranged and protected.
3. Do any persons store the vegetables of this group in an indoor cellar?
4. If so, which plan has proved most satisfactory?

CHAPTER LXXIX

STORING VEGETABLES IN COOL AND WARM ROOMS

Vegetables requiring cool conditions. Vegetables of group 3, such as the onion and garlic, require cool, dry conditions with free circulation of air. These conditions can be secured in a good dry indoor cellar or in some unheated room in the house. Onions should be placed in crates for good ventilation. Garlic cloves, as has already been said (Chapter LV), may be hung upon nails or hooks after braiding their tops together.

Vegetables requiring warm conditions. Vegetables of group 4, including the sweet potato, squash, and pumpkin, require warm, dry conditions with free circulation of air. These conditions can be secured in a warm furnace room or beside a warm chimney. Sweet potatoes may be spread out on boards or wrapped separately in paper and placed in crates.

STUDY OUTLINE

1. What vegetables are included in group 3?
2. How are these stored?
3. What vegetables are included in group 4?
4. How are these stored?

HOME AND COMMUNITY WORK

1. How are all group 3 vegetables stored in your community?
2. How are all group 4 vegetables stored in your community?
3. Describe the method that is most satisfactory for storing the vegetables of each group.

CHAPTER LXXX

SAVING THE BY-PRODUCTS

Economy is one of the most valuable lessons any person can learn. The saving of by-products for some good use is one way to practise economy.

By-products as food for animals. When vegetables and fruit are being prepared for preserving or for the regular meal, a quantity of by-products become available for use. Some of these, including vegetable and fruit peelings, may be fed to poultry and to pigs. Root crops may be fed to rabbits or to poultry.

By-products improve the garden soil. All vegetable and fruit waste not used in feeding animals should be placed back upon the soil. To do this dig trenches 10 to 12 inches deep. Put the waste into these trenches and cover it with earth. These by-products decay and help to improve the soil.

Vegetable and fruit waste help build the compost heap. If the gardener is preparing a compost heap, vegetable and fruit waste will help to build it. Directions for making one have already been given (Chapter X).

Preserving left-overs in refrigerator or cooler. Portions of vegetables and small quantities of fruit left over from a meal are frequently wasted when no cooler is used. If no part of the refrigerator is intended especially for vegetables, they can be placed directly upon the ice contained in the cooler. If there is no cooler the food can be placed in a cool moist place for a short period. For the best results

the tops should be left on root crops until they are needed for the table.

How to keep left-over vegetables crisp. Young onions, lettuce, radishes, and rhubarb left over from a meal can be kept crisp if wrapped in moistened paper and placed on the cellar floor.

How to utilize left-overs. Left-over vegetables and fruits may be prepared in a variety of ways so that nothing need be wasted. Onion tops, beet tops, and parts of other vegetables may be used in salads, pickles, soups, and greens. Watermelon rinds may be saved for preserves. The juices resulting from the cooking of vegetables should be saved for soups. When by-products or unused foods are utilized for some good purpose we are conserving food, adding to our own comfort, and promoting the welfare of the nation.

STUDY OUTLINE

1. How may vegetable waste be utilized for improving the soil?
2. For what purpose is a refrigerator or cooler used in the home?
3. How can moist paper be used to save vegetables?
4. Give two good reasons for trying to save food.

HOME AND COMMUNITY WORK

1. What use, if any, is made of vegetable waste in your own home? In the homes of your neighborhood?

2. In what other ways than the ones suggested here is food economized in the families of your community?

SECTION THREE

SUGGESTIONS TO TEACHERS

FIG. 99. *An exhibit of home garden crops, Milwaukee. A successful showing of what young gardeners can do in the production and preservation of crops.*

SUGGESTIONS TO TEACHERS

These suggestions to teachers are included in the book for the purpose of encouraging every teacher or supervisor of gardening to make the most out of his work.

LESSON ASSIGNMENTS

The chapters in most cases have been made short. This plan was followed because many teachers desire to assign subject matter for lessons in complete units. With a few exceptions one chapter will not be too much for one day's lesson. Where chapters are long they have been subdivided. In these few cases more than one lesson may be given to a chapter.

CHAPTERS FOR REFERENCE AND STUDY

Because of the nature of Chapters VI, VII, VIII, XV, XVI, XXII, and LXVIII they are intended chiefly for reference but may also be assigned for special study and discussion by the pupils.

PROJECTS AND PROBLEMS

At the end of Section I there are three groups of exercises suitable for indoor class work. If the teacher desires additional matter of this nature for classroom work it can be secured in bulletin form from the United States Department of Agriculture. Most books on gardening and agriculture also contain lists of classroom exercises or experiments for school use. Both the author's handbook for teachers, *Agriculture in the Public Schools*, and the Ivins-Merrill *Practical Lessons in Agriculture*, contain a large number of classroom exercises suitable for pupils doing gardening work.

STUDY OUTLINE AT END OF CHAPTERS

Questions for aiding the pupil in the study of the lesson are found in the "Study Outline," given at the close of most of the chapters.

HOME AND COMMUNITY WORK

The directions given at the close of the chapters under "Home and Community Work" should be given particular attention in teaching with this book. These studies will teach the child to note the methods used in producing and preserving garden crops in his home and community. This survey of local conditions should result in increasing the child's interest in gardening.

CLASS ROOM AND OUTDOOR WORK

To secure the best results the child should have regular classroom instruction in the principles of gardening, accompanied and supplemented by practical experience out of doors (Fig. 100). Classroom instruction necessitates the use of a textbook on gardening. The work outlined in

FIG. 100. *Teacher and pupils at work in a school garden. The knowledge gained here later will be put to good use in the home garden.*

the textbook may be supplemented by state and federal leaflets and bulletins on the subject, garden magazines, literature published by

seed houses and nurseries or brought out and distributed by private and patriotic organizations, general textbooks on gardening and agri-

FIG. 101. *Teaching pupils how to garden in a school garden, Washington.*

culture, and library books on insects, birds, soils, plants, fertilizers, and garden crops.

Classroom instruction in gardening may be given during the entire year or during either semester, and receives regular school grades or credits. Additional credits are allowed for outdoor garden work. The outdoor work should provide an opportunity for each child to plant, cultivate, and harvest at least one garden crop. If land is available on the school grounds or on some vacant lot near by, the child will find much pleasure and will be greatly benefited by doing the actual work of planting and cultivating his crops under the personal direction of an instructor (Fig. 101).

In many instances this opportunity for outdoor work will be furnished by a garden at the child's home. Whenever this happens to be

the case the parents will offer helpful suggestions and will gladly coöperate with the school in carrying out the program arranged by the school authorities.

TYPES OF GARDENS

The garden at the school. The school garden on the school grounds has very definite reasons for its existence. It has a distinct educational value. It serves (1) as an outdoor laboratory for the school where the home gardeners are trained in the principles of gardening; (2) it can be made the model for many home gardens; (3) it can be used as a community garden containing the individual plots for the children of the

FIG. 102. *At the end of a lesson in the school garden, the pupils are putting the paths in order.*

neighborhood (Fig. 102); (4) demonstrations in the use of lime, fertilizers, crop rotation systems, and irrigation methods can be carried out.

Schools should not inaugurate work that they cannot properly complete. The school garden that is abandoned when school closes reflects

FIG. 103. *A large tract, or community garden for girls. After completing their work on the tract, the girls are able to plan and make home gardens without the assistance of a teacher.*

on the efficiency of the entire system. On the other hand a successful school garden is a credit to the school and is evidence of an enthusiastic school teacher or principal. Work in the school garden should blend with the garden work at home. A properly managed school garden should mean a more successful home garden. The following are some of the advantages of the school garden:

1. The children are taught in groups on individual plots the proper way to prepare the seed bed, to plant seeds, to thin plants, and all other garden operations. This group instruction, which is economy in education, is of course impossible in the home garden.

2. All the children become interested in gardens and gardening since enthusiasm is sure to be contagious.

3. Certain social values are obtained. The cooperative use of land, tools, water, and seeds, teaches the child to recognize the rights of others; it impresses upon him the fact that the world does not begin and end with himself.

4. The children are less tired at the end of the day, because regular periods of outdoor garden work break the monotony of the daily schoolroom routine.

5. The growing child gets the exercise in the open air that he needs, while at the same time his activities are under wise direction.

6. The school garden gives opportunity for the study of natural life and forces. The life history not only of plants but of insects, birds,

FIG. 104. *A boy's garden, Cincinnati. The garden, a part of a large tract, contains 4/10 of an acre and yielded the owner $138 in one year.*

earthworms, and moles is under observation, and the action of heat and light and other natural forces is being constantly illustrated.

FIG. 105. *Scattering lime on a large tract garden. Sour clay soils are greatly improved by the addition of lime.*

7. The school garden offers opportunity for vitalizing all school subjects through correlation. The interest in natural history in plant and animal life, that is developed and fostered in the school will be carried into the home.

Large tract garden. Progressive citizens in all parts of the country are urging the teaching of gardening in the schools. Each year boys and girls are becoming more and more interested in the subject. Because of these new demands and the constantly growing interest on the part of the children, school authorities everywhere are searching for available garden sites that will furnish garden plots for large numbers of children.

Business men and public spirited citizens are cooperating with the schools by offering them at little or no cost large tracts of land for garden purposes under the direction of the school faculties.

These interested citizens realize that when all vacant land is utilized, it affords an opportunity to increase the food supply and makes any city a more attractive place to live in.

When large tracts are at the disposal of the garden teacher and supervisor, usually each child can be given an opportunity to do something

FIG. 106. *Supervisors, teachers, and gardeners, Union Tract, Cleveland.*

in the way of producing food for himself and the family (Fig. 104). Pupils residing in densely populated areas take advantage of the large tract to secure ample garden space, and those who have a very small space for a garden at home can usually secure additional space, if they desire, on a large tract.

The large tract system has been found to be more economical than either the home or the school garden on the school grounds, because demonstrations in planting can be given on one tract to the children of several school districts at a time. Some garden supervisors find that the pupils take a greater interest in working large tracts. They say this is due to the greater scope for competition and friendly rivalry among gardeners.

Tracts should be selected in as many different parts of the school district as possible. If a child has to travel long distances to his garden,

The school board furnished all the tools used in tilling the Union Tract.

much of his enthusiasm will be lost before he begins his work. When possible the garden tracts should be so located that no child will be required to travel over two miles to work.

Vacant Lots. The vacant lots within a city, land adjacent to parks, or even a part of a park itself will provide a large acreage for gardens. Some of the larger cities have under the cultivation of young gardeners as many as thirty tracts ranging from 3 to 50 acres in size. If the larger pieces of land cannot be had, then small vacant lots are recommended. In any case, the land should be divided into individual plots for the use of each child. This plan marks definitely the space each child cultivates.

Advantages of the large tract. Community school gardens on the large tracts not only increase food production, but also offer some advantages

FIG. 107. *This large tract garden has an unusually fine location.*

in plowing, planting, watering, cultivating, and harvesting (Fig. 105). They can also be supervised at less cost than home gardens, or small gardens at each individual school. On a large tract one teacher may be able to supervise the work of two hundred children, while the task would be impossible if he were required to visit the home of each child. Any general instruction can be given more easily and more economically upon the larger tracts than upon the home garden or the school garden on the school grounds.

Small lots are frequently available in almost any part of the town or city, with the possible exception of the very congested districts. Plans should be carried out to list all such small areas in the fall in order that garden work may not be delayed in the spring because space was lacking early in the season. By obtaining the land in the fall, leaves and stable fertilizers may be added during the season if desired.

Disadvantages of the large tract. While many things are gained by gardening in large tracts there are objections to the plan. Some of

It affords garden plots for pupils who have no home garden space.

these are the following: The products are exposed and frequently large quantities are stolen; considerable time is lost going to and from the gardens; children are kept away from home a large part of the time; it is troublesome to carry home the crops, if they are produced in large quantities; unless tools and tool houses are provided, it means taking the tools back and forth each day; where shelter houses are not provided, children are exposed to storms; water for watering out plants, drinking water and rest rooms are frequently a considerable distance away, necessitating loss of time from actual work. Several of these disadvantages are being overcome in many places by the school authorities. Tools and tool houses, rest rooms, drinking fountains and water systems are being provided. In spite of these disadvantages, every large school system should have land in connection with some of the school buildings, as well as a few large garden tracts. Lands used in this way serve as models for the children of the community. In these tracts many

interesting and valuable demonstrations can be worked out to the advantage of the community.

The garden at the home. Perhaps five million children in the United States plant and cultivate home gardens each year. This number will be increased when all boys and girls are taught gardening in the schools as they should be. Where this subject has been made a part of the regular school work, a much greater interest is shown and better garden crops are produced.

Some of the advantages of the garden at the home are the following:

1. The home garden places the child upon his own responsibility more than does the garden at the school, or the large tract garden where many persons are working together. This is good for the child's personal development.

2. Parents can aid in directing the garden work in the home garden or, if experienced in gardening, can profit by the instruction the child receives at school.

3. The work performed by the child at home in cooperation with the parent on a school project is good for the parent, the child, and the community in general.

4. The home garden helps to make the home self-sustaining. It gives the child an opportunity to contribute toward keeping up the family table.

5. The home garden is the most convenient, and therefore offers an opportunity for the child to work a few minutes at a time when not otherwise engaged.

6. Parents feel more comfortable to have the children working at home than when they are working on some distant school garden or large tract.

7. Both parents and children are pleased to see garden plants growing on their own home lots. It seems to intensify their feeling of ownership, and gives an added security to their sense of possession.

8. Thrift is taught when the child sells the surplus and places money in the savings bank.

9. Like the school garden and the large tract garden, the home garden gives an opportunity for outdoor exercise with a definite object in view.

10. Vegetables produced at home release cars for transporting other food, and for hauling coal and other materials that are needed for our homes.

The aims of school garden work. The ultimate aims of all forms of garden work and all types of gardens under school direction are: To afford children an opportunity to have a form of exercise that will put them in good health and keep them so; to teach a greater appreciation

FIG. 108. *A section of a 7-acre school garden. Each young gardener cultivated 1/20 of an acre, keeping an account of all receipts and expenditures.*

of the value of food; to furnish a means of utilizing children's spare time and keep them off of the streets; to teach the elements of agriculture, an industry on which our lives depend; to teach children to learn by observation and to give them a practical training; to influence character by appealing to a child's love of nature; to prepare the child for citizenship by teaching him to respect public and private property; to teach independence and self-reliance; to bring the school and home into closer relationship by having the child apply at home what he has been taught in the school garden; and to enable the coming generations of men and women to grow a sufficient amount of food for their own use.

SCHOOL EXHIBITS OF GARDEN CROPS

Perhaps one of the best means of creating an interest in producing and preserving garden crops is by having exhibits. These may be held at the school as a collection of individual exhibits, composed of specimens produced from one garden by any child; in a community house or public hall as a group, club, or company exhibit; at a county fair as a county exhibit, representing work of many children from one county;

FIG. 109. *Among school garden exhibits this one of Portland, Oregon, stands almost unrivaled.*

and at a state fair, as a collection of any of the above kinds of exhibits from different parts of the state.

A community leader, a chairman of a Teachers' Institute, a captain

of a company, or a club president, frequently arranges for an exhibit in connection with some special meeting of a particular group.

FIG. 110. *An exhibit of vegetables from Columbus and Cincinnati school gardens at the Ohio State Fair.*

The vegetables, canned goods, and other items that make up the exhibit, should be arranged with care and made as attractive as possible. Everything should be clearly marked to indicate exactly what it is. Crops of similar kind, whether canned, dried, or in their natural state, should be shown together. All vegetables exhibited must be clean, free from disease, and with tops removed. Uniform inexpensive plates or containers should be used.

Classification of exhibit crops. The following outline[1] of garden crops may prove suggestive in arranging the exhibit.

[1] From R. L. Watts's *Vegetable Gardening*, pp. 196-199. The groupings used throughout this book may also provide satisfactory plans for preparing exhibits.

Class I. Annual vegetables
- Subclass I. Crops grown for their subterranean parts
  - Group 1. Root crops (5 to each plate)
    - Beets
    - Carrots
    - Parsnips
    - Radishes
    - Salsify
    - Turnips and rutabagas
  - Group 2. Tuber crops (5 to a plate)
    - Potatoes
  - Group 3. Bulb crops (5 to a plate)
    - Onions
    - Leeks
- Subclass II. Crops grown for their foliage parts
  - Group 4. Cole crops (1 to a plate)
    - Cabbages
    - Cauliflower
    - Kohl-rabi
  - Group 5. Pot-herb crops used for greens (1 to a plate)
    - Spinach
    - Beets
    - Dandelion
  - Group 6. Salad crops (1 plant to a plate)
    - Lettuce
    - Endive
    - Celery
    - Parsley
- Subclass III. Crops grown for fruit or seed
  - Group 7. Pulse crops (1 pint to a plate)
    - Beans
    - Peas
  - Group 8. Solanaceous crops
    - Tomatoes (5 to a plate)
    - Eggplant (2 to a plate)
    - Peppers (5 to a plate)
  - Group 9. Cucurbitaceous or vine crops
    - Cucumbers (3 to a plate)
    - Melons (1 to a plate)
    - Squashes (1 to a plate)

Group 10. Corn
Sweet corn (4 green ears in husk)
Class II. Perennial vegetables
Asparagus (2 bunches to a plate)
Rhubarb (6 stalks to a plate)

Programs. Special programs can be held in connection with these exhibits. Garden pageants, songs, essays, drills, lantern-slides, and photographs or drawings of gardens will make them interesting.

Classification of exhibits. Best *individual* exhibits, to be confined to articles produced from one garden by any pupil. Five or more plates may be required, no two to be of the same kind of crop.

Best *school* exhibit, to be confined to articles produced by the pupils from any one school building, consisting of at least fifty plates. As many different garden crops as possible should be shown (Fig. 109).

FIG. 111. *This excellent exhibit of vegetables displayed by the garden class of Lincoln Agricultural School, New York, shows what young boys can do.*

Best *group*, club or company exhibit, to be confined to articles produced by members of a regularly organized group, club or company, from one or more school buildings, consisting of at least one hundred plates of as many different garden crops as can be secured (Fig. 111).

Best *county* exhibit, to be confined to articles produced by the children from one county. See that all of the crops that can be grown in the county are represented in the county exhibit. It should require 250 plates or, if a canning exhibit, 250 cans.

A *state* exhibit may be made up of any or all of the above described exhibits (Fig. 110).

Premiums. Premiums given for exhibits may consist of merchandise, cash, ribbons, certificates or merit cards and flags.

Leading merchants are frequently willing to contribute *merchandise* from their stores for premiums. We should not ask too much of merchants, but small donations will add interest to the exhibit. Use the small pieces of merchandise for individual premiums, and the larger ones for the school, group, club, or company premiums. A bookcase, tools for working the garden, or similar things of permanent value that will become the property of the school make suitable premiums.

The premiums most commonly used are *cash*. Many small premiums are better than a few large ones as the distribution of rewards among a larger number of pupils makes the competition more interesting.

Many persons feel that *ribbons* of different colors make desirable premiums. The rank of each prize is printed on the ribbon and is also indicated by the color. For example, the first prize may be red, the second blue, and the third white.

Certificates or *merit cards* of different colors and kinds, and American *flags* in different sizes, are occasionally given as premiums.

SCORE CARDS

Score cards are valuable guides for showing the teacher or pupil the most important points to be considered in grading or scoring a project. For score cards to use in judging any particular garden crop write your state experiment station, state college of agriculture, or state superintendent of schools. The cards used below may prove helpful for the purposes indicated.

Score Cards for Judging Home Gardens

I[1]

	Scale of points		Score awarded
A General appearance		20	
Arrangement of rows	5		
Freedom from weeds	5		
Cultivation and care	5		
Proper thinning	5		
B Choice of vegetables		15	
For home use	5		
For marketing	5		
For canning	5		
C Freedom from pests		15	
Spraying for insects	5		
Spraying for disease	5		
Other remedial measures	5		
D Evidences of		15	
Continuous cultivation	5		
Companion cropping	5		
Succession cropping	5		
E Care of tools		10	
F Value of produce		15	
Used at home	5		
Sold in the market	5		
Used for canning	5		
G Accuracy of garden records		10	
Total		100	

II[2]

	Scale of points	Score awarded
1. Effort	20	
2. Care of garden and tools	35	
3. Record of work done	10	
4. Value of produce	35	
Total	100	

[1] Published and recommended by the Garden Division of the United States Bureau of Education, Washington.

[2] From the Ivins-Merrill *Practical Lessons in Agriculture.*

Score Card for Judging School and Vacant Lot Gardens[1]

	Scale of points	Score awarded
1. Attendance	15	
2. Care of garden and tools	25	
3. Coöperation	15	
4. Records of work done	10	
5. Value of produce	35	
Total	100	

Score Card for Judging Vegetable Exhibits

	Scale of points	Score awarded
1. Quality or condition	50	
2. Completeness of display	15	
3. Uniformity of specimens exhibited	10	
4. Arrangement of display	10	
5. General appearance	15	
Total	100	

Score Card for Judging Canned Vegetables

	Scale of points	Score awarded
1. Flavor	65	
2. Color	15	
3. Condition of vegetable	20	
Total	100	

[1] From the Ivins-Merrill *Practical Lessons in Agriculture.*

Score Card for Judging Jelly

	Scale of points	Score awarded
1. Flavor	50	
2. Color	15	
3. Consistency	20	
4. Texture	15	
Total	100	

Score Card for Judging Canned Fruit

	Scale of points	Score awarded
1. Color	15	
2. Flavor	60	
3. Condition of fruit	15	
4. Condition of sirup	10	
Total	100	

Score Card for Judging Preserves

	Scale of points	Score awarded
1. Flavor	50	
2. Color	15	
3. Consistency	20	
4. Condition of fruit	15	
Total	100	

SOME SUGGESTIVE FORMS

The forms suggested below have been used with success in many parts of the country.

Instructions for Merit Record[1]

I

	Points
1. Daily attendance—full time	5
2. Good deportment—best behavior	10
3. Perfect spading, raking, and leveling of garden bed	10
4. Straight rows, evenly planted and plant rows filled out	10
5. Garden with no weeds	10
6. Best cultivation, keeping surface soil well pulverized	10
7. Watering—done when needed; no dried plants; no baked soil	10
8. Best notebook, showing each step and figures kept by each child	10
9. Keeping all insects controlled and destroying them	10
10. Best selection of varieties	5
11. General appearance—neatness of garden bed, path, and plants	10
	100

II

WEEKLY MARKINGS, DETERMINED BY LEADER OF DIRECTING COMMITTEE OF EACH GARDEN, BASED ON POINTS SHOWN IN I

Weekly inspection date	Merit marks											Total	Remarks
	1	2	3	4	5	6	7	8	9	10	11		

[1] This form was issued by the Women's Directing Committee for children's gardens in the city of Chicago.

Teacher's Record of Home Garden Visited

I

Pupil's name..... Age..... Grade.....

Address..... Location of garden..... Size.....

Child's experience in work..... Character of soil.....

Attitude of parents..... Local conditions.....

RECORD OF INSPECTIONS

Date	Condition of garden	Suggestions offered	Remarks

II

SKETCH OF GARDEN PLAN RECORDED BY INSPECTOR

Child's Report of Receipts and Expenditures

Months	Receipts	Expenditures	Months	Receipts	Expenditures
Jan.			July		
Feb.			Aug.		
March			Sept.		
April			Oct.		
May			Nov.		
June			Dec.		
Total			Total		

Profit for year.....

An Account Form for Children[1]

1. Name .....

2. Size of garden .....

EXPENSES

Date	Items	Time	Amount
	Seeds		
	or		
	plants		
	Labor		
	Tools		

Total .....

RECEIPTS

Date	Vegetables, fruit or flowers	Amount	
		Sold	Used

Total .....

Total expenses .....

Profits .....

The purpose of the following survey is to find out the location, if possible, of every garden in the city, and the name and address of the person cultivating it. The street on which the garden is located should be given and where convenient the number of the house or lot. Where there is no number, give the side of street on which the garden fronts and near or between what streets it is situated. In case of community or neighborhood clubs, the names of the officers should be given. In the last column state whether a boy, a girl, or an adult cultivated the garden.

[1]A form used by the Children's Garden Club of Normal, Illinois.

Form for Making Survey

Board of Education
City of Chicago

Garden Survey of ..... School. Reported by .....

School Extension Dept. Date ..... 191 .....

LOCATION OF GARDEN			SIZE		CULTIVATED BY		Boy girl or adult
Street and number or	Near or between	E, W, N, S side of street	Length	Width	Name	Address	

Combination Form for Report and Score Card[1]

I

Directions: Repeat in later columns those scores that remain the same after the first inspection. Add the two or three columns and divide by two or three to get the average score. Take into account in scoring, age of pupil and difficulties overcome. Three or more inspections recommended, May to September, if worth while.

	Highest possible score	Judges' scoring inspection			Average
		1	2	3	
Selection of plot, difficulties overcome, improvement made (describe, remarks)	10				
The plan and general arrangement of the garden	10				
Care in soil preparation and planting indoors and out, stand of plants	10				
Vigor and general condition of plants, freedom from insects and disease	10				
Cultivation, freedom from weeds, and general care during the summer	30				
Kinds, quantity, and quality of crops grown	30				
Total	100				

[1] This combination form was used by the Cincinnati schools.

1. Has practically all work been done by the pupil?.....

Exceptions.....

2. Approximate value of products raised for season?.....Sold?.....

Records kept?.....Quality.....

Inspection dates.....

Underline dates when pupil was instructed

Award.....

.....

Signature of Inspector.

II

Name of school.....

Name of teacher.....Room.....

Name of pupil.....Home address.....

Age of pupil.....Sex.....Grade March 1.....

Location of garden (school, home, etc.).....

Approximate size (in sq. ft. or sq. rds.).....

Parent or guardian approves.....Dates.....

Kind of vegetables .....

.....

.....

Kind of flowers .....

.....

Check above, at each inspection, plants still growing, with number of inspection. Underscore those started early indoors by pupil.

Products suitable for exhibition, canning, etc .....

.....

Products canned.....

Products dried.....

Years in garden work.....Success.....

Amount paid toward school-garden expenses.....

Source of seed .....Remarks.....

.....

Form for Certificate of Enrollment for Prospective Gardeners[1]

Name.....Age.....Grade.....

Street and number of residence.....

If garden is not at home give location.....

Size of garden.....

Telephone number.....Date.....

Name of city.....

Name of garden teacher.....

Years of experience in gardening.....

Do you desire your garden inspected for credit?.....

Do you desire free garden helps issued by the state or federal government?

.....

State briefly the difficulties upon which advice is wanted.....

.....

Return when filled out to (name of person).....

Form for Application for Garden Space[1]

Name of city.....

Name of school or organization having garden work in charge.....

Fill out and return to.....

Name of person desiring space.....

Street and number.....

I wish to apply for space for a garden. Size of garden desired.....

My telephone number is.....Date.....

[1] Planned by Indiana Committee on Food Production.

Form for Donation of Vacant Lots[1]

Name of city..... .....Organization in charge

Fill out and return to.....

Name in full.....

Street and number of residence.....

I offer the following lots for garden purposes.....

.....

.....

.....

Size of lots.....

Location, street and lot number.....

My telephone number is.....Date.....

A Form for Record Sheet[2]

(NAME OF CITY) HOME GARDEN ARMY OR CLUB

Name of company or club.....

Name of garden soldier or club member.....

Size of plot.....Location of garden.....

Date	Kind of work	Amount of time	Expenses	Quantity of veg.	Used or sold	Value for home use	Value of veg. sold
	Totals					Totals	

Visits by garden teacher.....

.....

By garden supervisor.....

.....

[1] Planned by Indiana Committee on Food Production.

[2] Tack this card where tools are stored. The form is somewhat similar to one used in Grand Rapids, Michigan.

A Form Used by Teachers for Reporting Results of Garden Work [1]

Date.....State.....City.....

Total number of home gardens planted.....

Estimated average size of each.....Total size.....

Total number of school gardens at the schools.....

Estimated average size of each.....Total size.....

Total number of vacant lots or other gardens .....

Estimated average size of each.....Total size.....

Estimated value of products used at home.....

Value of products sold.....Value of canned goods sold.....

Estimated value of canned products for home use.....

Name of company reporting .....

Number of garden soldiers.....

Garden Teacher-Director.....

Garden Supervisor.....

Form for Canning Project Record Sheet [2]

Name.....Home address.....

Canning center at.....

.....

MATERIAL CANNED			LABOR		
Date	Kind of material canned	Cost including can	Number of hours	Value at 10c per hr.	Total investment

[1] Recommended and used by Garden Division, Bureau of Education, Washington.

[2] Used in Cleveland schools.

FORM FOR LABELS ON CANNED GOODS[1]

Contents ..... Name.....

Variety..... Age.....

Date of canning..... School.....

Note to teacher. For detailed information in preparing forms for, as well as conducting, school exhibits and contests in corn, flower, and vegetable growing see the author's *Agriculture in the Public Schools.*

THE COMPOSITION OF VEGETABLES

It is interesting to note the composition of some of our important garden crops as shown below.[2]

	Water	Protein	Fat	Carbohydrate	Fiber	Ash	Calories per lb.
Asparagus fresh	94	1.8	.2	3.3	.8	.7	105
Beans, string	89.2	2.3	.3	7.4	1.9	.8	195
Beans, dried	7.1	20	1.5	65		4	1625
Beets	87.5	1.6	.1	9.7	.9	1.1	215
Cabbage	91.5	1.6	.3	5.6	1.1	1	145
Celery	94.5	1.1	.1	3.3	1		85
Corn	75.4	3.1	1.1	19.7	.5	.7	470
Cucumbers	95.4	.8	.2	3.1	.7	.5	80
Turnip greens	86.7	4.2	.6	6.3		2.2	220
Lettuce	94.7	1.2	.3	2.9	.7	.9	90
Peas, green	74.6	7	.5	16.9	1.7	1	465
Potatoes, white	78.3	2.2	.1	18.4	.4	1	385
Potatoes, sweet	69	1.8	.7	27.4	1.3	1.1	570
Tomatoes	94.3	.9	.4	3.9	.6	.5	105

Vegetables with the exception of potatoes and beans have little actual food value. The salts, acids, and the cellulose which they contain keep our digestive organs working more perfectly.

Persons refraining from eating vegetables, therefore, are much more likely to become ill than those who use a reasonable quantity in each day's ration.

[1] Used in Cleveland schools.

[2] Arranged by Emma E. Pirie in *The Science of Home Making.*

ADDRESSES OF STATE EXPERIMENT STATIONS

Persons desiring bulletins of interest upon the production or preservation of garden crops published by each state experiment station may obtain them by using the addresses given below.

ALABAMA, Auburn, Uniontown, Tuskegee Institute
ALASKA, Sitka
ARIZONA, Tucson
ARKANSAS, Fayetteville
CALIFORNIA, Berkeley
COLORADO, Fort Collins
CONNECTICUT, New Haven, Storrs
DELAWARE, Newark
FLORIDA, Gainesville
GEORGIA, Experiment
GUAM, Island of Guam
HAWAII, Honolulu
IDAHO, Moscow
ILLINOIS, Urbana
INDIANA, La Fayette
IOWA, Ames
KANSAS, Manhattan
KENTUCKY, Lexington
LOUISIANA, Baton Rogue, Audubon Park, New Orleans, Calhoun
MAINE, Orono
MARYLAND, College Park
MASSACHUSETTS, Amherst
MICHIGAN, East Lansing
MINNESOTA, University Farm, St. Paul
MISSISSIPPI, Agricultural College
MISSOURI, Columbia, Mountain Grove
MONTANA, Bozeman
NEBRASKA, Lincoln
NEVADA, Reno
NEW HAMPSHIRE, Durham
NEW JERSEY, New Brunswick
NEW MEXICO, State College
NEW YORK, Geneva, Ithaca
NORTH CAROLINA, West Raleigh
NORTH DAKOTA, Agricultural College
OHIO, Wooster
OKLAHOMA, Stillwater
OREGON, Corvallis
PENNSYLVANIA, State College
PORTO RICO, Mayguez
RHODE ISLAND, Kingston
SOUTH CAROLINA, Clemson College
SOUTH DAKOTA, Brookings
TENNESSEE, Knoxville
TEXAS, College Station
UTAH, Logan
VERMONT, Burlington
VIRGINIA, Blacksburg, Norfolk
WASHINGTON, Pullman
WEST VIRGINIA, Morgantown
WISCONSIN, Madison
WYOMING, Laramie

UNITED STATES AND STATE PUBLICATIONS OF INTEREST TO GARDENERS

Much valuable literature upon gardening is published by the federal and state governments. The United States Bureau of Education has issued many valuable leaflets and bulletins upon gardening. Many have recently been issued by the Garden Division of the Bureau. These have been written for particular regions of the country. Any one desiring the list of available bulletins should address the Bureau of Education, Washington, D. C. The list published for your region will be furnished. From this list the leaflets desired may be selected and ordered.

A series of School-Home Garden Circulars of the Bureau of Education should also be in the library of all persons interested in gardening.

The United States Department of Agriculture has also published a large number of excellent bulletins and circulars upon the production and preservation of garden crops. The following list includes some of those most frequently recommended.

List of Farmers' Bulletins

157, "The Propagation of Plants."
196, "Usefulness of the American Toad."
198, "Strawberries."
203, "Canned Fruits, Preserves, and Jellies."
213, "Raspberries."
218, "The School Garden."
220, "Tomatoes."
232, "Okra: Its Culture and Uses."
245, "The Renovation of Worn-Out Soil."
254, "Cucumbers."
255, "The Home Vegetable Garden."
256, "Preparation of Vegetables for the Table."
257, "Soil Fertility."
266, "Management of Soils to Conserve Moisture.
278, "Leguminous Crops for Green Manuring."
282, "Celery."
289, "Beans."
295, "Potatoes and other Root Crops as Food."
324, "Sweet Potatoes."
354, "Onion Culture."
359, "Canning Vegetables in the Home."
406, "Soil Conservation."
408, "School Exercises in Plant Production."
428, "Testing Seeds."
433, "Cabbage."
471, "Grape Propagation, Pruning, and Training."
488, "Diseases of Cabbage."
544, "Potato—Tuber Diseases."

548, "Storing and Marketing Sweet Potatoes."
553, "Pop Corn for the Home."
554, "Pop Corn for the Market."
642, "Tomato Growing in the South."
643, "Blackberry Culture."
664, "Strawberry Growing in the South."
714, "Sweet Potato Disease."
753, "Handling, Grading, and Marketing Potatoes."
766, "Common Cabbage Worm."
799, "Carbon Disulphid as an Insecticide."
804, "Aphids Injurious to Orchard Fruits."
818, "The Small Home Garden."
821, "Watermelon Disease."
829, "Asparagus."
832, "Trapping Moles and Utilizing their Skins."
837, "The Asparagus Beetles and Their Control."
847, "Potato Storage."
853, "Home Canning of Fruits and Vegetables."
856, "Control of Disease and Insect Enemies of the Home Vegetable Garden."
868, "Increasing the Potato Crop by Spraying."
870, "The Community Fair."
871, "Fresh Fruits and Vegetables as Conserves of Other Staple Foods."
879, "Home Storage of Vegetables."
881, "Salting, Fermentation, and Pickling Vegetables."
884, "Saving Vegetable Seed."
887, "Raspberry Culture."
900, "Home-made Fruit Butters."
901, "Everbearing Strawberries."
914, "Control of the Melon Aphis."
921, "The Principles of Liming the Soil."
925, "Cabbage Diseases."
934, "Home Gardening in the South.
936, "The City and Suburban Vegetable Garden."
948, "The Rag-Doll Seed Tester."
970, "Sweet Potato Storage."

State Publications

Requests for state bulletins and circulars should be made directly to the addresses given below. To procure publications of other states write to the addresses of the experiment stations given on page 321.

Alabama Agri. Exp. Sta., College Station, Auburn. *Circ. 14*, "Vegetable Growing in Alabama."

Arizona Agri. Exp. Sta., Tucson. *Circ. 27*, "Spring Vegetable Garden."

Colorado Agri. Exp. Sta., Fort Collins. *Bulletin 199*, "Vegetable Growing in Colorado."

Georgia Agri. Exp. Sta., Experiment. *Bulletin 106*, "Vegetable Gardening."

Illinois Agri. Exp. Sta., Urbana. Vol. XV, no. 25, *Extension Bulletin*, "War Garden."

Indiana Agri. Exp. Sta., Lafayette. *Circ. 80*, "Home Gardens."

Kansas Agri. Exp. Sta., Manhattan. *Kas. Extension Serv. Circ. 1*, "Mulching Home Gardens."

Louisiana Agri. Exp. Sta., Baton Rouge. *Bulletin*, Vol. V, no. 7, "Vegetable Garden."

Maryland Agri. Exp. Sta., College Park. *Course 9, Ex. Serv. Dept.*, "Vegetable Growing."

Minnesota Agri. Exp. Sta., University Farm. *St. Paul Ex. Bul. 17*, "Farm Vegetable Garden."

Nebraska Agri. Exp. Sta., Lincoln. *Bulletin 142*, "Vegetable Gardens in Irrigated Farms in Western Nebraska."

New Hampshire Agri. Exp. Sta., Durham. *Press Bulletin 16*, "Vegetables for the Home Garden."

New Jersey Agri. Exp. Sta., New Brunswick. *Ex. Bulletin*, Vol. I, no. 2, "The Home Vegetable Garden."

New York Agri. Exp. Sta., Ithaca. *Reading Course 58*, "Planning the Home Vegetable Garden."

North Carolina Agri. Exp. Sta., Raleigh. *Bulletin*, "The Home Vegetable Garden."

North Dakota Agri. Exp. Sta., Agri. College, N. D. *Circ. 5*, "The Farm Vegetable Garden."

Ohio Agri. College, Columbus. *Ex. Serv.*, Vol. XIII, no. 16, "Home Vegetable Garden."

Oklahoma Agri. Exp. Sta., Stillwater. *Circ. 13*, "Home Vegetable Garden."

Oregon Agri. Exp. Sta., Corvallis. *Ex. Bulletin 128*, "Gardens."

Rhode Island Agri. Exp. Sta., Kingston. Vol. 1, no. 4, "Children's School and Home Gardening."

South Carolina Agri. Exp. Sta., Clemson. *Bull. 166*, "Home Gardening."

Tennessee Agri. Exp. Sta., Knoxville. *Ex. Bulletin*, "Farm Gardening."

Texas Agri. Exp. Sta., College Station. *Circ. 3*, "Truck Farming in Texas."

Virginia Truck Exp. Sta., Norfolk. *Bulletin 10*, "The Home Vegetable Garden."

West Virginia Agri. Exp. Sta., Morgantown. *Ex. Circ. 4*. "City Garden Contest."

HELPFUL BOOKS

Allen. *Cabbage, Cauliflower and Allied Vegetables.* Orange Judd Co.

Bailey. *The Principles of Vegetable Gardening.* The Macmillan Co.

Bailey (ed.). *Garden Making.* The Macmillan Co.

Corbett. *Garden Farming.* Ginn & Co.

Davis. *School and Home Gardening.* J. B. Lippincott Co.

French. *How to Grow Vegetables.* The Macmillan Co.

Green. *Popular Fruit Growing.* Webb Publishing Co.

Henderson. *Gardening for Pleasure.* Orange Judd Co.

Ivins and Merrill. *Practical Lessons in Agriculture.* American Book Co.

Kilpatrick. *The Child's Food Garden.* World Book Co.

Lloyd. *Productive Vegetable Gardening.* J. B. Lippincott Co.

Meier. *School and Home Gardening.* Ginn & Co.

Nolan. *One Hundred Lessons in Agriculture.* Rowe, Peterson & Co.

Parsons. *Children's Gardens.* Sturgis & Walton Co.

Powell. *The Orchard and Fruit Garden.* Doubleday Page Co.

Rexford. *The Home Garden.* J. B. Lippincott Co.

Shepperd and McDowell. *Elements of Agriculture.* Webb Publishing Co.

Upham. *An Introduction to Agriculture.* D. Appleton & Co.

Watts. *Vegetable Gardening.* Orange Judd Co.

Wilkinson. *Modern Strawberry Growing.* Doubleday Page Co.

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